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Title:
Cross-Cultural Composition

Synthesizing the Sound of Taiwanese Cultural Elements

Cross-Cultural Composition: Synthesizing the Sound of Taiwanese Cultural Elements

Accompanying commentary for portfolio of Compositions

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PhD

University of Bristol 2019

Word count: 16311

Abstract

This PhD explores the possibility of synthesizing cultural elements from my Taiwanese heritage and Western musical training, through different compositional approaches and composed works. The portfolio pieces present the whole spectrum of my PhD study. “Sound” is the core element I work with, while employing different cultural materials and instrumentations, and the concepts and attitudes of spectralism and electroacoustic music have strongly influenced my compositional aesthetic. I have explored how Taiwanese cultural elements such as Nanguan, Beiguan, and aboriginal music can be synthesized into new musical forms, presented variously in electronic media, instrumental ensemble, combinations of traditional instrument and electronics, and orchestral score. The written commentary presents the compositional ideas behind each of the pieces, and relevant approaches, techniques, and structural analyses. The content of this PhD includes notated scores, supplementary performance materials, and documentation (audio/video media files) of live performance of each work.

Keywords: Sound, Taiwanese cultural material, spectral music, electroacoustic, Nanguan, Beiguan, Aboriginal music

Author’s declaration

I declare that the work in this dissertation was carried out in accordance with the requirements of the University's Regulations and Code of Practice for Research Degree Programmes and that it has not been submitted for any other academic award. Except where indicated by specific reference in the text, the work is the candidate's own work. Work done in collaboration with, or with the assistance of, others, is indicated as such. Any views expressed in the dissertation are those of the author.

SIGNED: ..... DATE:.....

Acknowledgments

The accomplishment of this PhD has been one of my most significant challenges that I ever had to face. Without the support, patience and guidance of the following people, this research would not have been possible. I owe my deepest gratitude to:

Professor Neal Farwell who undertook to act as my PhD supervisor, his wisdom, knowledge and commitment to the highest standards inspired and motivated me. Special thanks to him, for the many years he spent reading the different drafts of my scores and papers, and for being a constant guide throughout the research process.

Dr. Michael Ellison for providing musical direction and feedback at different points along the way.

Thanks to my beloved wife, for her infinite amount of encouragement and support.

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Portfolio Contents

Total time: approx. 86’ (not including Appendix).

Printed scores are provided in hardcopy. Digital media, software tools, and performance recordings are combined on a single USB memory stick.

Acousmatic miniatures

For electroacoustic sound

- *Shifting Space* (2’40’’)

- *Continuous Space* (4’04’’)

- *Circle* (4’39’’)

Digital soundfiles.

Zoom, for piano and live electronics (9’00’’)

Premiere concert: New Music Devir, 15, June, 2015

Venue: Victoria Rooms, University of Bristol, UK

Performed by Shang Jin (piano) and Hsiao, Yung-Shen (electronics)

2018 International conference on musical arts and pedagogy, 2018

Venue: National Pingtung University, Taiwan

Performed by Wu, Ya-Hsin (piano) and Hsiao, Yung-Shen (electronics)

Printed score, software in Max and electroacoustic soundfiles, performance files.

***Winter Fantasy*, for string quartet (11'00'')**

Bristol New Music Festival, 23, Feb, 2014.

Venue: Victoria Rooms, University of Bristol, UK

Performed by Bozzini Quartet

Printed score, recording of Bozzini.

***Breeze through Pines*, septet for conducted mixed ensemble (10'00'')**

NME Concert, 11, Dec, 2015

Venue: Victoria Rooms, University of Bristol, UK

Performed by University of Bristol New Music Ensemble, conducted by Neal Farwell

Printed score, Complete. Recording of NME.

***October's Opal*, for mixed quartet (6'00'')**

Ensemble Variances Residency Concert, 4, Dec, 2015

Venue: Victoria Rooms, University of Bristol, UK

Performed by Ensemble Variances

Longlisted for "International Rostrum of Composers", Palermo, May 2017

Printed score, Ensemble Variances recording.

***Mystery of Nature*: a duet for flute and guitar (16'00'')**

Contemporary Music Venture (CMV) Concert, 2016

Venue: St Georges, Bristol, UK

Performed by Flaugissimo Duo

Printed score, recording from CMV concert.

Wing: for GuZheng and electronics (10’35’’)

Kuo, Ming-Chin Zheng Concert, 25, Nov, 2017

Venue: National Taiwan University(NTU), Taiwan

Performed by Kuo, Ming-Chin (guzheng) and Hsiao, Yung-Shen (electronics)

Printed score, performance files.

KUBA: Orchestral work (12’32’’)

Printed score

Appendix: two orchestral Scores for animated films

Basmati (5’30’’): Printed score, digital video file including music.

Maximall (6’00’’): Printed score, digital video file including music.

Introduction

This PhD explores western contemporary music techniques, and Taiwanese traditional music materials, and their synthesis in different instrumentations and music genre types: from pure electroacoustic to the mixture of acoustic and electroacoustic, from western contemporary to synthesis of cultural material, and from single genre type to mixtures of music genres.

The portfolio contains various approaches which attempt to establish my own aesthetic of music creation and compositional language. I have both Taiwanese heritage and western training, and an exploration of the space between these two poles has always attracted me. Taiwanese traditional music has a richness and complexity of sonic signature and cultural meanings. What are the timbral characteristics of these sounds? Why does Taiwanese music sound the way it does? How might one resynthesize the sound character via a contemporary western platform, and reveal its poetic imagery? This research explores how analysis and resynthesis of sound can transform Taiwanese traditional music materials into western instrumental works by applying computer music technology and European spectral music concepts.

Besides the technical aspect, the research outcome also shows my attitude to the cultural materials. The multiple cultures of Taiwanese traditional music such as Nanguan, Beiguan, and Aboriginal music are not only valuable as an archive and inheritance, but

also invite the contemporary composer to explore aesthetic meanings in the materials and give new life to these vernacular tunes in a new aesthetic context.

Many composers use cultural elements as compositional material. I note particularly the approach of Tristan Murail, who incorporated such elements indirectly into his work. He is inspired by the different attitude to sound, prevalent in Eastern culture. As he says: "Reading recently some reflections on Eastern (Sino-Japanese to be precise) thought, it occurred to me that, to some extent, they illustrated my attitude towards the phenomenon of music. For example, the Eastern approach to defining an object might consist of successive circumscriptions of an object, rather than breaking the object down into its constituent parts."[1] This idea corresponds to my own thinking about sound materials. I will point to relevant examples in the chapters on specific pieces.

My creative practice uses both purely acoustic instrumentation and combinations with electronics. The use of cultural materials and the exploration of timbral possibilities have always been central strands of my research. However, during the PhD, my research expanded in its dimensions, from pure technical, abstract, formal aspects to more concern about how music can be connected and communicated to musicians and listeners in practice, and how the musical content interacts with the intercultural

[1] Tristan Murail, *Target Practice*. Contemporary Music Review Vol. 24, No. 2/3, April/June 2005, p. 149

environment. My concern has grown, one might say, for how the music has real existence in the world.

Personal musical background

My primary concern as a Taiwanese concert music composer has been to synthesize cultural elements from my Taiwanese heritage and Western training using various compositional approaches. I started learning classical piano when I was four years old. During my early education, I took part in several school bands and choir groups. My formal musical education took place at National Taiwan Normal University (NTNU), where I studied Western music theory, composition, computer music, music history, and Taiwanese music culture. During my master's degree, I had the opportunity to be visiting researcher at the Center for Computer Research in Music and Acoustics (CCRMA) at Stanford, where I studied real-time music technology and electroacoustic music composition. After my master's degree, I started to consider how to integrate my own cultural background into compositional thinking and music technology.

Background information on Taiwanese music

The elements of Taiwanese music I used in the portfolio were selected from the most representative traditional musical instruments and genres in Taiwan: guzheng, Nanguan, Beiguan, and Tsou aboriginal music. I see choosing materials as the first step: all materials I collected, such as melodies, rhythmic patterns, or sound samples from traditional culture, are sonic objects and are widely recognized in my daily life in

Taiwan. But in order to represent a Taiwanese sound image, composers cannot merely insert the materials into our music; for example, directly using melodies or rhythmic patterns without context or compositional ideas. My goal is to use the materials as sonic objects and transform them into music in accordance with the individual ideas behind each composition. The instrument or musical genre may be found in Chinese culture, but the ideas behind the compositions, the specific ways of transforming the materials, and the materials' sound image are all Taiwanese.

Tsou aboriginal music come exclusively from the Alishan region of Chiayi in Taiwan. The tune I used in KUBA was transcribed from a Tsou festival and published in an academic thesis by Chang, Hsin-Ying.[2] Although the guzheng, Nanguan, and Beiguan originated in China, performance styles and musical character vary according to location and artist.

In ZOOM, I recorded the guzheng sound myself; the single note sample is considered a sonic object and is broadly symbolic of Taiwanese sound. In Wing, the sound of the guzheng was created and performed by the Taiwanese guzheng musician Kuo, Min-Chin. There is a conceptual development from ZOOM to Wing: the way the guzheng sound is used expands from taking it as a sonic object to looking at is as the integration

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[2] Chang, Hsin-Ying, *A Study of Mayasvi Music in Cou (Tsou) Culture: Based on Tapangu Tribe* (unpublished master's thesis, National Taiwan Normal University, 2014) p. 99. https://hdl.handle.net/11296/g7x9qr, accessed 10/10/2019

of sound and live performance. The Nanguan tune 冬天寒 (Froid d'hiver) is transcribed from a recording of a performance by Taiwanese Nanguan artist Tsai, Hsiao-Yueh (b. 1941). The performance was recorded and published by Radio France record label Ocora.[3] The Beiguan percussion elements 鑼鼓經 (gong-drum tablature) and the English translation of the text are referenced in an academic thesis by Hsieh, Tsung-Shin.[4]

Taiwan's new music context

Brief history of contemporary Taiwanese music[5] [6]

From 1895 to 1945, Taiwan was colonized by Japan. Music education during the Japanese colonial period was strongly influenced by several Japanese music teachers and Taiwanese musicians who had studied in Japan. In general, the music education still focused on the Western tonal music system of the classical and romantic periods.

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[3] China: Nan Kouan, *Vol. 1: Music and Court Songs*, https://www.allmusic.com/album/china-nan-kouan-vol-1-music-and-court-songs-mw0000195564, accessed 10/10/2019

[4] Hsieh, Tsung-hsin, *Performance Technique of Chao-zhou Big Gong-Drum Music* (unpublished master's thesis, Chinese Culture University), p. 55. https://hdl.handle.net/11296/yc7yzp, accessed 10/10/2019

[5] Lien, Hsien-Sheng, *Modernity and Lyricism in the Contemporary Music of Taiwan and East Asia* (Taipei City: Tangshan Publishing, 2014), pp. 9–11.

[6] The Online Database of Taiwanese Musicians, http://musiciantw.ncfta.gov.tw/hall.aspx, accessed 10/10/2019.

In 1949, the government of the Republic of China retreated to Taiwan after losing the Chinese Civil War, and several musicians from China also came. ~~such as~~ Xiao, Er-Hua (b. 1906) and Zhang, Jin-Hong (1907–2002) made an important contribution to the teaching of music theory, and started to introduce early twentieth-century Western music history in Taiwan, such as Debussy, Bartok, Stravinsky, Hindemith, and Schonberg. In 1959, Taiwanese composer Hsu, Tsang-Houei (1929–2001), returned to Taiwan after finishing his music studies in Paris. Hsu introduced the new classical music after the Second World War and initiated several modern musical events in Taiwan, while strongly encouraging the younger generation of composers to use twentieth-century musical language to create. In the 1980s, the twentieth-century Western music language was fully introduced and absorbed by several Taiwanese composers, such as Lu-Yen (1930–2008) and Pan, Hwang-Long (b. 1945). This is when contemporary music in Taiwan really started and its horizons began to open up.

While contemporary music culture was continuing to develop in Taiwan, several composers brought computer music–related organizations and international conferences into this field: Wu, Ting-Lien (b. 1950) built a computer music studio at National Chiao Tung University (NCTU) in 1988, Tzeng, Shing-Kwei (b. 1946) established the Taiwan Computer Music Association in Taipei in 1999. Chao, Ching-Wen (b. 1973) initiated the Workshop on Computer Music and Audio Technology

(WOCMAT), which integrated composing and engineering, and brought Taiwanese computer music to its current international level.

Contextual references in spectral music

From electroacoustic music to spectral music

It was during my music studies at NTNU (2004–2008) that I was first introduced to electroacoustic music listening to a work by my teacher, Chao, Ching-Wen: Soundstates (2003) is a mixed work for solo percussion with prepared electronic sounds. I was fascinated to see how sound can be transformed in various ways and put together to form a piece of music. This was when I started composing my own electroacoustic music. Later on, when I studied at CCRMA, I heard the multichannel version of Jonathan Harvey's work Mortuos Plango Vivos Voco (1980). Harvey created it at IRCAM in Paris. Influenced by the school of spectralism, Harvey uses the concept of the harmonic series to structure the whole piece. I was interested in the inner structure of the sound, how sound can be perceived, and how sound works. I found electroacoustic music and spectral music are closely related in many ways, although they are theorized differently, and they have different exemplar composers and works. Because of Harvey's work, I decided to do my PhD in the UK. I wanted to explore my composition using spectral thinking, which looks into the acoustic structure of sound and makes music from it. What especially attracts me to it is that the concept of spectral

music can be connected to almost any kind of material via the concept of the sonic object and the harmonic series. As a Taiwanese composer, I started to explore how the spectral concept could be applied to my own cultural background in order to compose acoustic music, electroacoustic music, or a mix of both types in different formats.

From a Western view to an East-Asian vision

Both electroacoustic music and spectral music originated in Europe. Contemporary classical music started to develop in Taiwan only 60 years ago, and computer music began to develop in Taiwan around 30 years ago (from 1988 on). Taiwanese composers influenced by spectral music such as Chao, Ching-Wen (b. 1973) and Lien, Hsien-Sheng (b. 1959) returned to Taiwan after their study overseas around 2000–2005. Chao, Ching-Wen's work Natural Boundary (2006) mixes guzheng, violin, and cello using the concept of harmonic transformation. In his work Jeux des fleurs du prunier (2001) for violin and piano, Lien, Hsien-Sheng uses harmonic materials to enrich the texture of the music.

Taking a more East-Asian view of contemporary classical music, we see that Japan developed faster than Taiwan. The important composer Toru Takemitsu (1930–1996) was strongly influenced by French music such as Debussy and Messiaen. Takemitsu's attitude to being an East-Asian composer also influenced me in my reflection on being an East-Asian composer. Although Takemitsu learned technique from his study of the Western system, he integrated the concept of sound and the pentatonic approach, which

implies the return of tonality after the orchestra work A Flock Descends into the Pentagonal Garden (1977). Another work, Quotation of Dream (1991) for two pianos and orchestra, uses elements from Debussy's La Mer to portray Takemitsu's poetic imagination and the concept of the sea of tonality. Takemitsu did not use spectral music techniques in his compositions, but he inherited his approach to using sound from Debussy and Messiaen. The roots of spectral music lie in the French tradition, but the former was pushed further using computer technology.

Chinese composer Chen, Qigang (b. 1951) studied in Paris in the 1980s and was Messiaen's last private pupil. Chen is certainly conscious of electroacoustic music and spectral music, as he had also studied at IRCAM in Paris in the 1980s. His orchestral work Yuan (1988) shows his preoccupation with sound and space in a huge instrumentation. Although he received a complete musical education and is familiar with the latest Western musical techniques, he also wants to convey the linear tradition of East-Asian music and express personal emotion through his compositions. Chen successfully integrated Western musical techniques and Eastern musical philosophy. His well-known works such as Poème Lyrique II (1990) and Reflet d'un Temps Disparu (1995–1996) strongly express personal character and do not eschew the use of melodic themes. I attended Chen's composition workshop in 2015 and 2016 and have been strongly influenced by him in his emphasis on finding the composer's inner voice

rather than restricting ourselves to any particular environment or school. As Messiaen told him during their first class: Be yourself!

My aesthetics

I have been influenced by these composers' music and attitudes toward the integration of East and West, and I also share a similar cultural and musical background. My musical approach focuses on the exploration of cultural elements, especially sonic objects with the musical potential to be connected with and transform other materials. Spectral thinking can also integrate both pitched and non-pitched materials. The harmonic series and its distortion techniques can also be applied to linear elements, e.g. in synthesizing different modes with harmonic series variations as pitched materials, or finding the internal rhythm of a sonic object and extending it to create rhythmic elements. Using the materials and techniques of the sound objects enables me to construct an entire piece of music and express its sound image in accordance with its theme.

Synopsis

Part 1 – Starting Points

Chapter 1: Three Acousmatic miniatures are discussed: ***Shifting Space*** is a compositional study which explores the relationship of gesture and texture by creating movement and shape in the stereo image. ***Continuous Space*** is created from the same

sound materials as in ***Shifting Space*.** Whereas the earlier piece had a more *gesture-carried* structure, this piece is focused in a different direction: *texture-carried* structure.[7] ***Circle*** explores the pitch organization of electroacoustic music: how pitch can be treated as a part of timbre, and also have its own direction within the texture. The piece is a process of sound radiating from the middle point and expanding the spectral space in a circular shape.

Chapter 2: In ***Zoom***, the music explores the sound world of an essential Chinese instrument, the guzheng, by means of hybridizing the timbre of piano and guzheng. The guzheng character and gestures are transformed into piano performance; the piano sound is also transformed as an extended timbre. The piano and guzheng become fused, in a new space that we explore by zooming in and zooming out at different angles and perspectives.

Part 2 – Chamber and Ensemble Works

Chapter 3 ***Winter Fantasy*** explores classical Taiwanese Nanguan music and use of spectral techniques on the string quartet. I took the melodic-sound subject of "*Froid Est L'Hiver* (冬天寒)" from a recording as my source material. I analyze the time structure

[7] Smalley: "Where one or the other [of gesture or texture] dominates in a work or part of work, we can refer to the context as *gesture-carried* or *texture-carried*." Denis Smalley (1986). "Spectro-morphology and Structuring Processes", in Simon Emmerson (ed.) *The Language of Electroacoustic Music.* London: Macmillan, 1986, p. 83.

and the spectral movement of the source, and take this profile of sound as my material. This profile is the most important object of the piece: I wanted to re-synthesie the profile of the instrumentation of string quartet. The idea of the work is not to reproduce Nanguan music, as such, on the string quartet, but to realize the inner movement of the Nanguan sound world. Although they are different instruments in timbre, Nanguan and the string quartet both have the same quality of intimate chamber music.

Chapter 4 ***Breeze through Pines*** explores another traditional music, Beiguan, and transformation of the sound of Beiguan into a different ensemble. "'Beiguan' is one of the dominant traditional music genres in Taiwan. 'Bei' means 'North'; however, insiders also use it to refer a style of loud and strong music. It has a huge scope that consists of percussion and wind ensemble music, traditional stringed and woodwind instruments, theatre music, and refined songs."[8] *Breeze through Pines* starts from whispered voices which imitate the percussion sound, the piece then transforms in different layers of its overall structure. The variation of gesture, texture, and rhythmic materials grows bigger and bigger throughout the piece.

Chapter 5 ***October's Opal*** explores poetic imagery from an English-language poem, the sound and color of the poem being reflected into the quartet. Chapter 6 ***Mystery of***

[8] https://trd-music.tnua.edu.tw/en/TrdMusicDep/theory/Pak_koan, accessed 5/17/2019.

Nature explores four poetic images. Extended techniques and microtones are used in order to use timbral variety as part of expressivity.

Part 3 – Synthesis

Two final pieces synthesie western techniques, concepts, and aesthetics with Taiwanese culture elements. Chapter 9 ***Wing*** for Guzheng and electronics, which combines the Taiwanese traditional instrument with electronic playback, examines how the spectral concept can be realized at this cross-cultural interface, synthesizing the materials into a single sound. Chapter 10 ***KUBA*** expresses the inner drama of an aboriginal ceremony by treating the cultural materials as a sound object, deconstructed and reconstructed into a large-scale orchestral work.

Part 1 – Starting Points

Chapter 1 – Acousmatic Miniatures

The idea of sound is my starting point. The earlier part of this composition portfolio reflects my study of electroacoustic and spectral music. My work explores their synthesis in music for electronic and acoustic instruments together, but also in purely acoustic or electronic works. Analytical work on the music of Tristan Murail informs my attitude toward the sonic materials.

This attitude, to the working of sound, is coupled with an exploration of my cultural influences. I am trying to develop my own approach in synthesizing cultural heritage from Taiwanese traditional music into western contemporary art music, from both aesthetic and technical perspectives.

Before I wrote these three acousmatic miniatures, I read Smalley's monograph "Spectromorphology: Explaining Sound-Shapes".[9] The concept of gesture and texture as discussed in the paper interested me. What principles are used to connect non-pitched sound object materials? How can we define a musical phrase and structure in sound? Several of Smalley's insights inspired me to devise and experiment with my own principles for structuring sound.

[9] Denis Smalley, "Spectromorphology: Explaining Sound-Shapes", *Organised Sound* 2(2) (1997), 107–26.

Shifting Space: a Study in Gesture and Texture

This is a compositional study which explores the relationship of gesture and texture, using stereo placement and motion to structure the material. The raw sound materials are studio recordings of everyday objects from the kitchen: pot, plastic bag, rice, and eggs. I recorded these materials as if they were "instruments", and tried to make phrases and control the dynamic shapes by hand. The source materials are stereo recorded in the studio, using close microphone techniques. The approach aims to obtain a "dry" sound without room reverberation, so as to avoid conflict between recorded reverberation and composed spatial information.

Figure 1 – Source recording using stereo close microphone techniques

Software-based transformation tools were employed to manipulate the gestural and textural qualities of the material. The sound objects were transformed via different synthesis techniques to change their spectral quality and shape, such as filtering, phase vocoder, and pitch shifter. Time-based sound editing tools such as time-flexing, slicing, and reverse helped to form new phrases by multi-layering different sound objects. More specifically, the time-flexing tool helped to change phrase durations and sample positions; the slicing tool helped to reorganize the sound objects in a series of tiny samples to create a propelling force of gesture; and the reverse tool helped to make short gestures, and also to change the perception of concrete sounds.

Different processed sound objects combine to form phrases, then different sound phrases morph from one to another. The articulation of sound objects and sound phrases are shaped via automation curves to create dynamic change, spatial panning, and varying stereo width (illustrated in Figure 2).

This piece is mainly in a *gesture-carried*[10] structure. The panning in this piece serves to shift the location of sound objects, and to connect different sound objects through their placement in the stereo image.

Figure 2 – Digital score of Shifting Space

[10] Smalley, Spectromorphology, p. 83.

Continuous Space: Equalization and Node

This piece is created from the same sound materials as in *Shifting Space*. Whereas the previous piece emphasized a *gesture-carried* structure, this piece has a contrasting focus in its *texture-carried* structure. The plastic bag sample was stretched via phase vocoder. This long single material is manipulated by equalization: frequency bands are masked or highlighted through time. The sound is perceived to morph continuously between "note", "node" and "noise", to borrow further terms from Smalley.[11]

The stereo manipulation in this piece moves slowly between narrow and wide views within the stereo image. The changing of stereo image creates a dynamic listening space, and influences the listener's perception of the sound. I wanted to focus on "space" as an important parameter in musical structure. The spectral space, manipulated by equalization, interacts with the stereo image that morphs in width and depth. The gestural material in this piece is not treated as a driving element, instead it is absorbed into the larger static space created by the dynamically changing texture. Thus, the space element is not a fixed environment, but an ever-changing texture with perceptible width and depth.

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[11] Note and noise have familiar meanings. A nodal spectrum is a "band or knot of sound which resists pitch identification." Smalley, Spectromorphology, p.67.

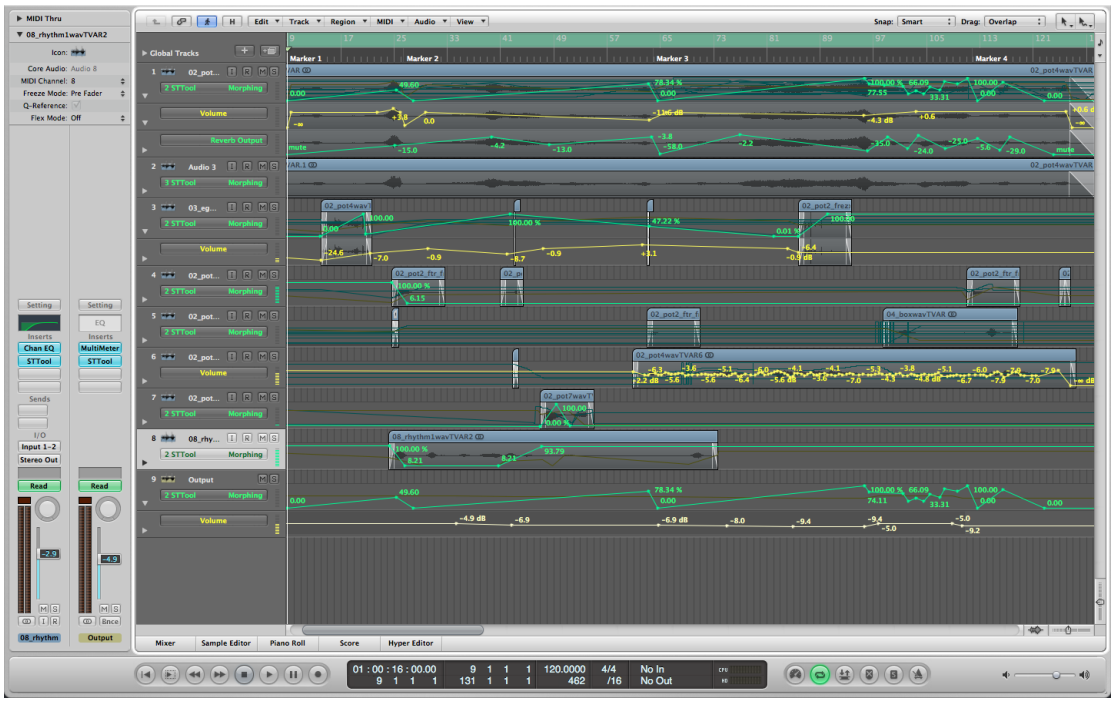

Figure 3 – Digital score of Continuous Space

Circle: Guzheng and Pitch

In this piece, I started to explore pitch organization within electroacoustic music.

Pitch, in western music, is the most important element to forming musical structure, but most of electroacoustic music is structured by gesture and texture. Discernible pitch is often part of sound, but does not usually act as the dominating function in electroacoustic musical structure.

I used a recorded sample of the Guzheng[12] as the only sound material in this piece. The original sample was recorded as the pitch C1,[13] and changed in pitch via sampler and pitch shifter tool. On the Chinese Guzheng, the strings are tuned as a pentatonic scale in the right-hand area. The area to the left of the bridge normally plays articulations by left hand, and the pitches on this side are more irregular and dissonant (see Figure 4).

Figure 4 – Chinese Guzheng

I designed a combination of two pentatonic scales as the pitch material (Figure 5). The scale above middle C is a C pentatonic. The second, below middle C, is more dissonant.

[12] Chinese zither, a plucked string instrument, widely used today and with a long history.

[13] Pitch names throughout this commentary use the convention that middle-C is C3

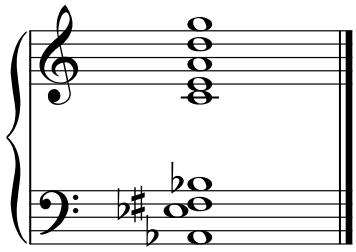

Figure 5 – Pentatonic chords

This pentatonic-spectral chord is the pitch material of the whole piece. The piece begins from middle C and expands its spectrum and density via timbral variation, finally returning to middle C to complete the circle. The techniques of transforming sound objects and sound editing that I used in previous pieces are also employed in this piece. What I wanted to do in *Circle* is explore how pitch can be treated as a part of timbre, and also have its own direction within the texture. The combination of different intervals forms the harmony, but the harmony is used to support the gesture or texture rather than serving as traditional functional harmony. Middle C is not the root of the harmony, but a center of sound. The piece is a process of sound radiating from the middle point and expanding the spectral space in a circle shape. The changing intervals above and below middle C also define a pitch space.[14]

[14] Figure 6 show the relationship, layering and through time, of the layer sound units in *Circle*.

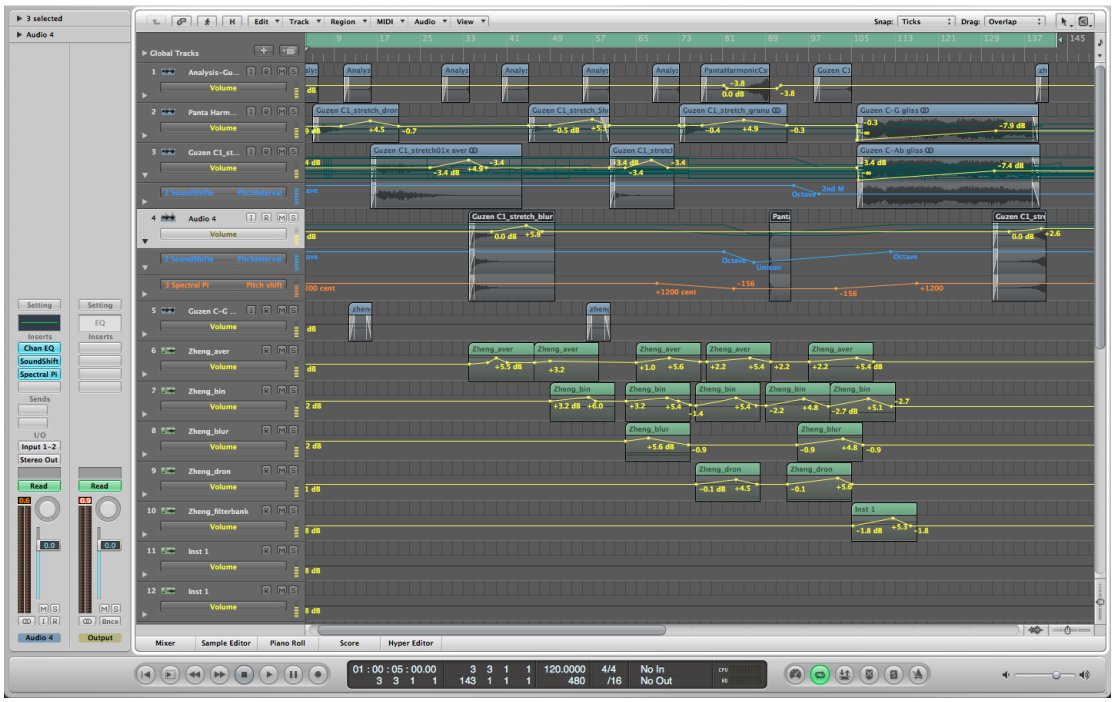

Figure 6 – Digital score of Circle

Chapter 2 – *Zoom*: Pentatonic Spectrum and Object Transformations

Before I wrote ZOOM, I listened to Jonathan Harvey's Mortuos Plango Vivos Voco (1980) and Chao, Ching-Wen's work Soundstates (2003). These two pieces had influenced me when I first started to learn about electroacoustic music: They both mix pitched and non-pitched materials very well without detaching sound and pitch. They also gave me insight into how to gradually move from one sound to another without the obvious use of sections. The goal I set myself in this piece was to integrate sound and pitch materials in a more systematic way, instead of using only intuition-based writing.

Inspiration from a Visual Effect

Zoom is a mixed electroacoustic work for live piano and soundfile playback. I wanted to extend the concept of pitch from *Circle* in this piece. My strategy is summarized informally in the progamme note which appears in the score:

> This piece is inspired by the camera effect: "Zoom In" and "Zoom Out". The process of zooming leads the human eye into a journey through space. A sound world can also create a journey: a sound object is not only an event, but a whole cosmos. In Zoom, a sound from the guzheng is analyzed, and then this single unit is enlarged into the whole piece. The music explores the sound world inside the guzheng spectral space, by means of hybridizing the timbre of piano and guzheng. The guzheng character and gesture are transformed into piano

performance; the piano sound is also transformed as an extended timbre. The piano and guzheng become fused, in a new space that we explore by zooming in and zooming out at different angles and perspectives. In revealing the world of the sound itself, Zoom also evokes the cultural imagination behind the sound.

Pitch Organization

I started with a single Guzheng sound sample, and analyzed its harmonic structure (first 0.3 seconds of the spectrum) via SPEAR.[15] The resulting spectrum (Figure 7), with pitches rounded to the equal-temperament semitone scale, is shown in Figure 8, measure 1. There are noise components in the Guzheng sound, which could not be analyzed into a meaningful pitch: they result in a very low pitch register, and do not seem to be part of the harmonic series. After deleting the sub-tone pitch Ab, I found there is one pair of pentatonic scales inside the harmonic series. Therefore, I rearranged them into a pentatonic spectral chord[16] as shown in Figure 8, measure 2. The choice

[15] SPEAR – "Sinusoidal Partial Editing Analysis and Resynthesis" – is a tool created by Michael Klingbeil. http://klingbeil.com/spear/, accessed 22/4/2019.

[16] By "spectral chord" I mean a vertical pitch combination that represents a set of salient partials in a spectrum. The chord typically does not repeat at the octave or other interval, and does not have an intrinsic functional relationship to other chords.

to render these scales in equal temperament, and assume octave equivalence in moving from spectrum to scale – a pragmatic response to writing for piano – leads to aesthetic choices and opportunities. I also made small adjustments to the chords (replacing Ab by A, and adding F) to form a pentatonic pair.

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par-text-partials-format
point-type time frequency amplitude
partials-count 2
partials-data
0 2 0.060000 1.305486
0.060000 261.63000000 0.000000 1.305486 261.63000000 0.000000
1 2 0.060000 1.290672
0.060000 329.63000000 0.000000 1.290672 329.63000000 0.000000
2 2 0.060000 1.290672
0.060000 233.08000000 0.000000 1.290672 233.08000000 0.000000
3 2 0.060000 1.290672
0.060000 440.000000 0.000000 1.290672 440.000000 0.000000
4 2 0.060000 1.290672
0.060000 185.00000000 0.000000 1.290672 185.00000000 0.000000
5 2 0.060000 1.290672
0.060000 587.33000000 0.000000 1.290672 587.33000000 0.000000
6 2 0.060000 1.290672
0.060000 155.56000000 0.000000 1.290672 155.56000000 0.000000
7 2 0.060000 1.290672
0.060000 783.99000000 0.000000 1.290672 783.99000000 0.000000
8 2 0.060000 1.290672
0.060000 106.87000000 0.000000 1.290672 106.87000000 0.000000
```

Figure 7 – Harmonic analysis data

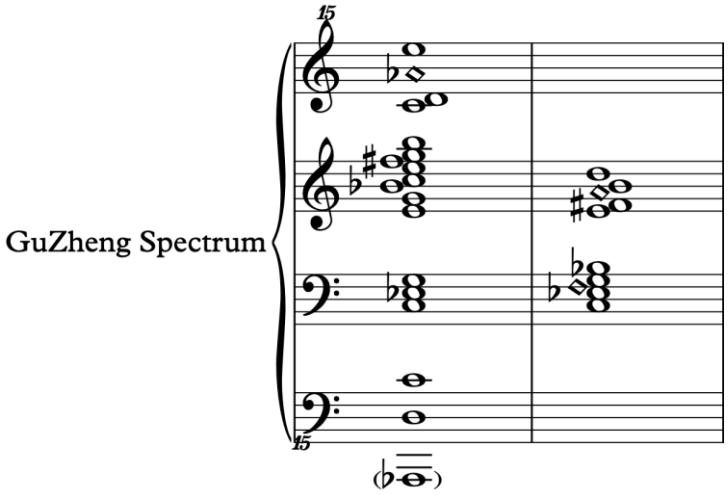

Figure 8 – spectral chord of *Zoom*

The Chinese pentatonic scale is made by stacking intervals of major second and minor third, in a particular order – M2, M2, m3, M2, m3 – with the five intervals adding up to one octave. For my purposes, I treat rotations of the interval set as being equivalent.

I created a generative rule, akin to creating a serial tone-row matrix, shown in Figure 9. A particular case of the pentatonic scale, rising from C, is shown in the left hand column, upper half. Reading left to right, each row starts from a member of the C pentatonic, and steps upwards using a particular rotation of the interval set. Thus each row is an octave of a pentatonic scale (though it may not start on the conventional tonic for a "major" or "minor" pentatonic). The resulting set of five pitches vertically, however, do not necessarily form a pentatonic collection.

In the lower half of Figure 9, a variant scale is used, descending M2, M2, M2, m3, m3. The left hand column descends from C. Across each row, the pitches step downwards using rotations of the interval set. The return, after five steps, to the original scale form, was important. I wanted to use the concept of a circle, as yielded by the pentatonic serial process, both in pitch material and in the form of the piece.

A	m3 C	M2 D	m3 F	M2 G	M2 A
G	M2 A	m3 C	M2 D	M2 E	m3 G
E	m3 G	M2 A	M2 B	m3 D	M2 E
D	M2 E	M2 F#	m3 A	M2 B	m3 D
C	M2 D	m3 F	M2 G	m3 Bb	M2 C
C	M2 Bb	m3 G	m3 E	M2 D	M2 C
Bb	M2 Ab	M2 F#	m3 Eb	m3 C	M2 Bb
Ab	M2 F#	M2 E	M2 D	m3 B	m3 Ab
Gb	m3 Eb	M2 Db	M2 B	M2 A	m3 Gb
Eb	m3 C	m3 A	M2 G	M2 F	M2 Eb

Figure 9 – Pentatonic pitch materials on C

In general, the strings of the guzheng are tuned as D pentatonic, I transposed the serial box from C to D as shown in Figure 10. This D pentatonic also appears in the spectrally derived chords of Figure 7. The conjunction makes a point of connection between the

constructed pitch material for the piano, and the emergent pitch material in the electronic sounds.

B	m3 D	M2 E	m3 G	M2 A	M2 B
A	M2 B	m3 D	M2 E	M2 F#	m3 A
F#	m3 A	M2 B	M2 C#	m3 E	M2 F#
E	M2 F#	M2 Ab	m3 B	M2 C#	m3 E
D	M2 E	m3 G	M2 A	m3 C	M2 D
D	M2 C	m3 A	m3 F#	M2 E	M2 D
C	M2 Bb	M2 Ab	m3 F	m3 D	M2 C
Bb	M2 Ab	M2 F#	M2 E	m3 C#	m3 Bb
Ab	m3 F	M2 Eb	M2 C#	M2 B	m3 Ab
F	m3 D	m3 B	M2 A	M2 G	M2 F

Figure 10 – Pentatonic pitch materials on D

Relationship of Sound and Note

In electroacoustic music, a sound object is considered to be the smallest unit to construct phrases and larger spans of music. But that raises the question of what is different between a sound object and a note. Can sound objects be combined and create hierarchy, in similar ways to note-based music; or does a sound object have its own life, acting as more than a discrete musical event?

In *Zoom*, the single sound of the guzheng sample is the sonic archetype of the whole piece. I hoped to explore how a single sound object could, dilated, create a growth process. As Grisey says: "object and process are analogous. The sound object is only a process which has been contracted, the process nothing more than a dilated sound object." [17]

The single sound object – that is to say, the sound sample used for my initial analysis – of the guzheng on pitch D, and its bending articulation D-E-D, has its own inner dynamic shape, and the life of the sound has its own delicate dynamics and timbral process.

I use this morphology and transform it into piano writing and the combination of piano and guzheng sound. Therefore, the whole piece is the process of transforming the guzheng sound morphology. The effect of zooming in or zooming out, with regard to the durational scale of the sound object, is akin to the effect of a visual zoom: attention is drawn to different sizes of space, changing dynamically over time. During the process, I hoped to explore the threshold between the parameters of consonance and dissonance, pitch and timbre, gesture and texture, dilation and contraction. The timing of phrases,

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[17] Gérard, Grisey. " A composer's reflections on musical time" in Contemporary music Review, Volume 2, Paer1, 1987, p.269.

and the speed, become crucial: they change the listener's perspective on the object and on the form of the music itself.

With this perspective, one can consider again the pentatonic serial box I designed in the beginning. I can use it vertical combinations, moving from left to right accross the box, to create a process from consonant to dissonant, or I can juxtapose selections from different columns to obtain different timbral colour.

In the piano writing, I aimed to hybridize the two instruments by imitating some gestures and techniques from the guzheng. The piano becomes an extended instrument (Figure 11).

Electronic tool and design

In the electroacoustic part, the sound object of the guzheng is transformed into various new forms. Some are abstract, other are recognizable. The interface I use in live performance is a third-party tool created in Max.[18] I load all of the soundfiles for the electroacoustic cues into the patch, and the performer of the electroacoustic part can then trigger the cue via a MIDI pedal or at the computer keyboard. This interface gives interpretive space for the pianist to control the time and pacing of the music (Figure 12).

[18] The cue player patch I used is from CNMAT:http://cnmat.berkeley.edu/downloads, accessed 7/4/2019.

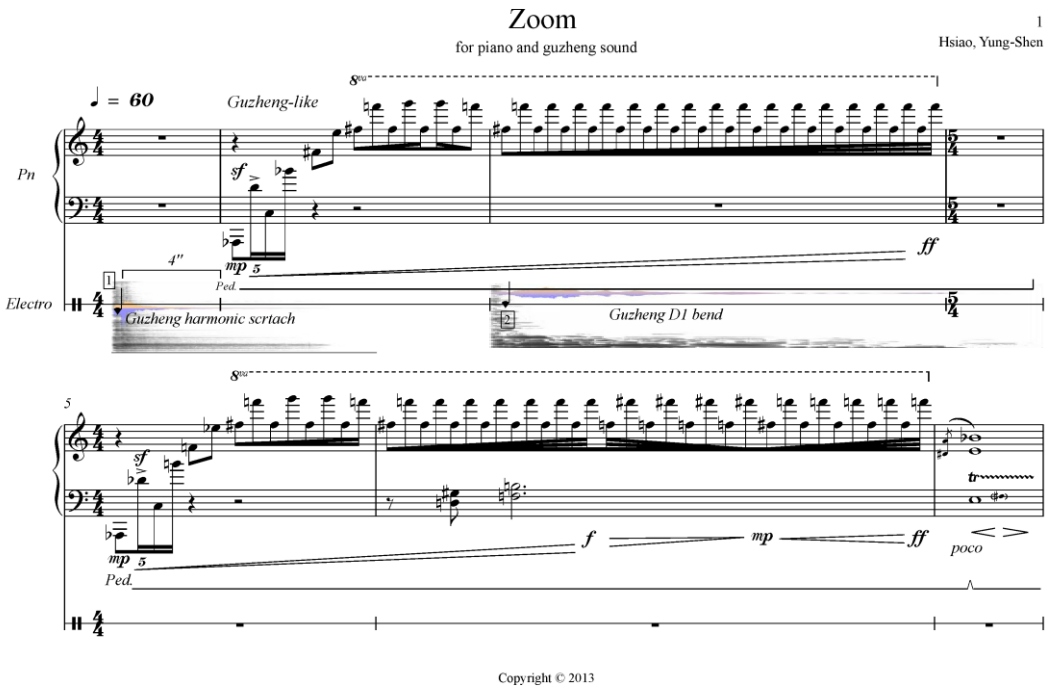

Figure 11 – Excerpt from *Zoom* m.1-7

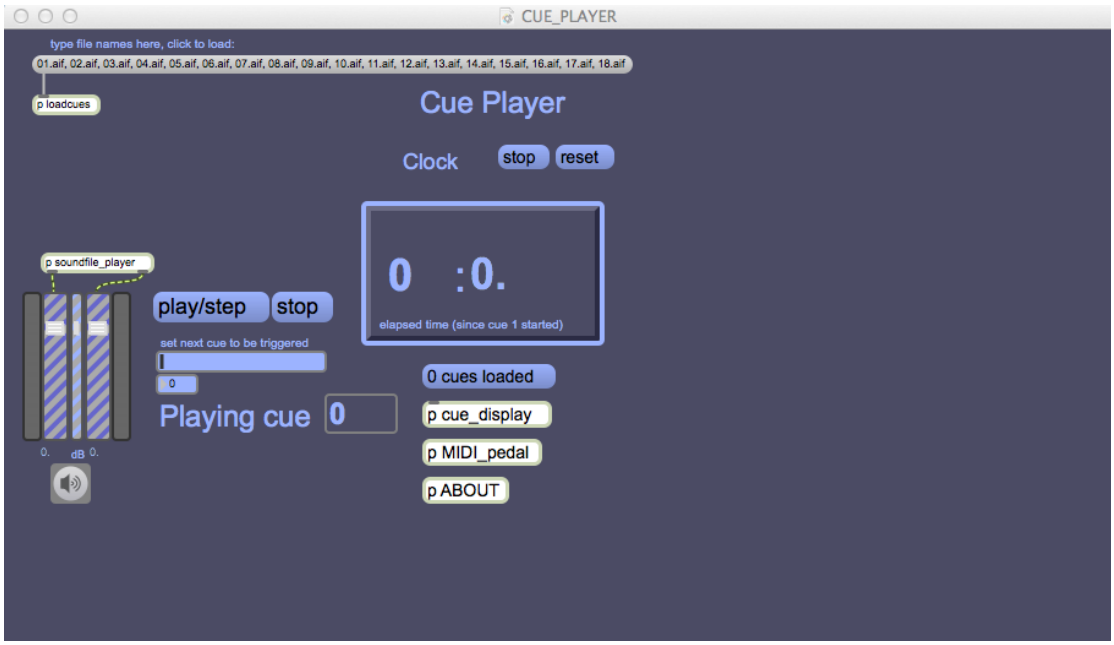

Figure 12 – Interface of electronic cue of *Zoom*

The electronic part demonstrates the transformation of the Guzheng sound into various kinds of sound morphology in relation to the development of whole piece.

Cue 1: The single Guzheng sound was transformed into a short sound at pitch D5 to start the piece, and also functions as a signal to the pianist to begin.

Cue 2: The single Guzheng was stretched in time to accompany the piano part as it completes the first phrase. The original Guzheng pitch bend is recognizable.

Cue3: The single Guzheng sound was transformed by granular synthesis, and synchronized with the last note of the piano in the introductory paragraph of the piece. At this stage, the Guzheng bend sound is still recognizable from the original sound source, but it already sounds different in timbre.

Cue 4: The Guzheng sound on D1 was hybridized with a piano sound on D1, by convolution. The original sound source is becoming more ambiguous.

Cue 5: The Guzheng sound on D1 was hybridized with the piano sound on D1 by convolution, and stretched into a long glissando from D1 to C1. The function of the long glissando brings the central pitch of the piece from D1 to C1. In this stage of the structural transformation, the original sound source becomes totally abstract and cannot be recognized. As a metaphor of the title *Zoom*, we gradually “zoom in” to the original sound source from cue 2 to cue 5.

Cue 6: The Guzheng sound on C1 is transformed into a gesture, which starts on a long note, the spectral content getting more and more complex with the crescendo, ending in an upward motion synchronized with a piano gesture.

Cue 7: The Guzheng sound on C1 is transformed into a drone, qualitatively suggestive of a voice sound, which functions as an echo of the piano phrase.

Cue 8: The Guzheng sound on D1 continues a variation similar to cue 6, also adding more fluctuation in speed.

Cue 9: The Guzheng sound on Ab varies in similar manner to cue 6, also adding the pentatonic pitches inside the sound.

Cue 10: The Guzheng sound on Ab continues variations similar to cue 9, and expands the sound into three small phrases, which contain gestures, harmonic sounds, and pentatonic pitches inside the sound.

Cue 11: The Guzheng pentatonic sound is synchronized with a strong cluster chord in the low register of the piano.

Cue 12: The Guzheng sound is transformed in timbre similar to cue 7, and has stronger gestural motion at the end of the phrase. In this stage of the development, the electronic sound is getting more and more independent in character.

Cue 13: The Guzheng sound is transformed dramatically via spectral filtering, and also contains more noise component. In this phrase, the piano sound is made by the timbral variation of muting action on the piano strings. The sound of the piano and electronic parts are hybridized together at the beginning of the phrase, then completed by the strong crescendo motion on the piano. The relationship of the piano and electronics is transformed inside a single phrase, the piano starting as a "sound" then returning back to notes, which mix with the sound of the electronic part.

Cue 14: The Guzheng pentatonic sound is transformed to higher frequency, with the harmonic components revealed. The timbre of the piano part is made by varying the mute pressure on the string inside the piano, and hitting the key at the same time to produce different harmonic sounds. The piano and electronic are hybrid in timbre throughout the phrase.

Cue 15: The Guzheng pentatonic sound is transformed into a longer phrase, with more timbre fluctuation and percussive gesture, which move away from the original sound character. In this stage, the electronic part starts to "zoom out".

Cue 16: The Guzheng pentatonic sound continues its variation of timbre similar to cue 15, and accompanied with a long transition on piano. The electronic part hybridizes the sound of guzheng and piano, with a more metallic sounding mixed drone.

Cue 17: The piano sound is transformed into the electronic part, accompanied with live piano which imitates the Guzheng performance technique. The electronic sound has similar fluctuation and sound shape to the original Guzheng sound source. At this stage, the character of Piano and Guzheng are exchanged. The Guzheng become piano, and the piano become Guzheng.

Cue 18: The piano sound is transformed into the electronic part, similar to cue 17, accompanied with the piano part which act as Guzheng-like cadenza.

Part 2 – Chamber and Ensemble Works

Chapter 3 – Spectral Re-Synthesis and Nanguan in *String Quartet – Winter Fantasy*

Before I started writing Winter Fantasy, I read papers by several spectral composers, including Grisey,[19] Murail,[20] Harvey,[21] and Joshua Fineberg.[22] These papers influenced me mainly in their treatment of how sonic objects can be expanded to create an entire structure using a harmonic series approach, and how I can use my own materials to create harmonic distortion and so build a musical hierarchy in a more systematic way.

[19] Gérard Grisey, "Did You Say Spectral?" trans. by Joshua Fineberg, *Contemporary Music Review*, 19.3 (2000), 1–3.

[20] Tristan Murail, "The Revolution of Complex Sounds", *Contemporary Music Review,* 24.2-3 (2005), 121–135.

[21] Jonathan Harvey, "Spectralism", *Contemporary Music Review*, 19.3 (2001), 11–14.

[22] Joshua Fineberg, "Guide to the Basic Concepts and Techniques of Spectral Music", *Contemporary Music Review,* 19.2 (2000), 81–113.

Figure 13 – Nanguan music performance in Paris, 1982[23]

This work is inspired by Nanguan music. “Nanguan music is a style of Chinese classical music originating in the southern of Chinese province of Fujian, and now also highly popular in Taiwan.”:

> The music aesthetics of Nanguan found its base from concepts of Chinese literature and Taoism. Music starts from morality, and in the ensemble the concepts of “Five elements” (五行) and “Yin and Yang”(陰陽) are apparent. For example the five parts of Téng-sì-koán (Siau, Jī-hiân, Sam-hiân, Pê, and Phek) are seated in order and clockwise. The percussive tone color of Pê and Sam-hiân are strong like “Yang”, and the linear and continual tone color of Siau

[23] https://nanguanbeiguan.ncfta.gov.tw/zh-tw/digital/27059, accessed 17/5/2019.

> and Jī-hiân are soft like “Yin”. The mixture of the percussive and linear tone colors represents the complimentary “Yin and Yang”. In the ensemble of Téng-sì-koán and Ē-sì-koán, the principle ”Metal Controls Wood” (“金木相剋”) is adopted; therefore, metallic and wooden instruments are played in alteration. The presentation of music emphasis is not on individual techniques but the tacit understanding among all parts. Thus, the Sam-hiân follows the Pê like a shadow, and the Jī-hiân fills in for the leading instrument Siau which requires occasional breathing. Both Sam-hiân and Jī-hiân do not surpass their leading parts.[24]

The special sound world of Nanguan interested me in its inner movement, instrumentation, rhythm, and aesthetics. I listened to a classical recording of Nanguan, which was recorded at Radio France and released by OCORA[25] in 1987 (Figure 14). In a somewhat tart review, Adam Greenberg writes:[26]

> A collection of songs of the Nanguan style, from Southern China. As stated in the liner notes, the style “may require repeated sessions before its beauty can be fully understood.” To reword, the style is most definitely an acquired taste. The

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[24] https://trd-music.tnua.edu.tw/en/TrdMusicDep/theory/Lam_koan, accessed 17/5/2019.

[25] Ocora (Office de Coopération Radiophonique) is a French record label specializing in field recordings of world music. It was founded in 1957 by the composer, pianist and musicologist Charles Duvelle with the musician Pierre Schaeffer. Ocora is part of Radio France.

[26] https://www.allmusic.com/album/china-nan-kouan-vol-1-music-and-court-songs-mw0000195564, accessed 7/4/2019.

music is performed to perfection by a troupe of musicians (some of the last ones left specializing in the style) from Taiwan. The vocal technique is intentionally overly nasal, which can quickly leave a grating effect on the listener. Aside from this, the instrumentation is traditional Chinese – the pipa, the tung hsiao end blown flute, the erh-hu, and the like. For those interested in Chinese music for the "silk and bamboo" style, this is definitely not the album to look for. For those interested in a much more obscure style that's almost forgotten even in China, it may be a much more appealing work.

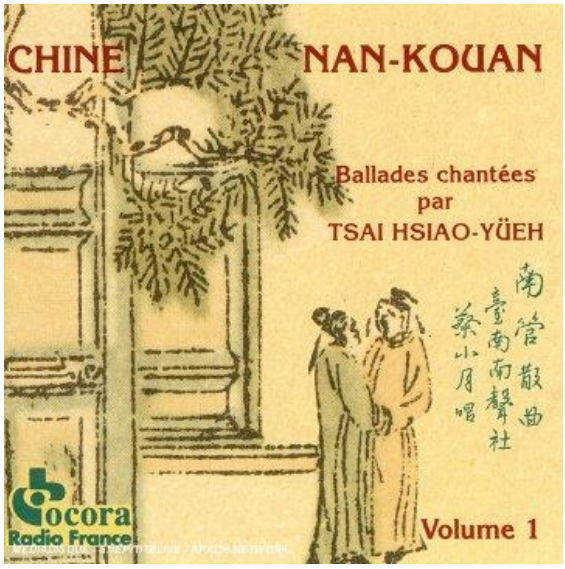

Figure 14 – Nanguan recording cover

The historical scoring of Nanguan music is in the form of words, which include lyrics, pitch, instrumental fingering, phrases, and rhythm. An example is shown in Figure 15. The score indicates the basic elements of the music, but there are many aspects that rely

on the musicians' interpretation, including the dynamics, articulation, speed, and ornamentation appropriate to the instruments.

Figure 15 – Nanguan music score[27]

I took the melodic-sound subject of 冬天寒(*Froid Est L'Hiver*) from a recording as my source material (see Figure 16). I analyzed the time structure and the spectral movement of the source, and took this profile of sound as my material. This profile is the most important object of the piece: I wanted to re-synthesie the profile in the instrumentation of string quartet. The idea of the work is not to reproduce Nan-guan music, as such, on the string quartet, but to realize the inner movement of the Nan-guan sound world.

[27] The score of Nanguan:冬天寒(*Froid Est L'hiver*) was derived from the class I participated in National Taiwan Normal University, TW: History of Taiwanese Music, Semester 1, 2006-7.

Although they are different instruments in timbre, Nanguan and string quartet both have the same quality of intimate chamber music.

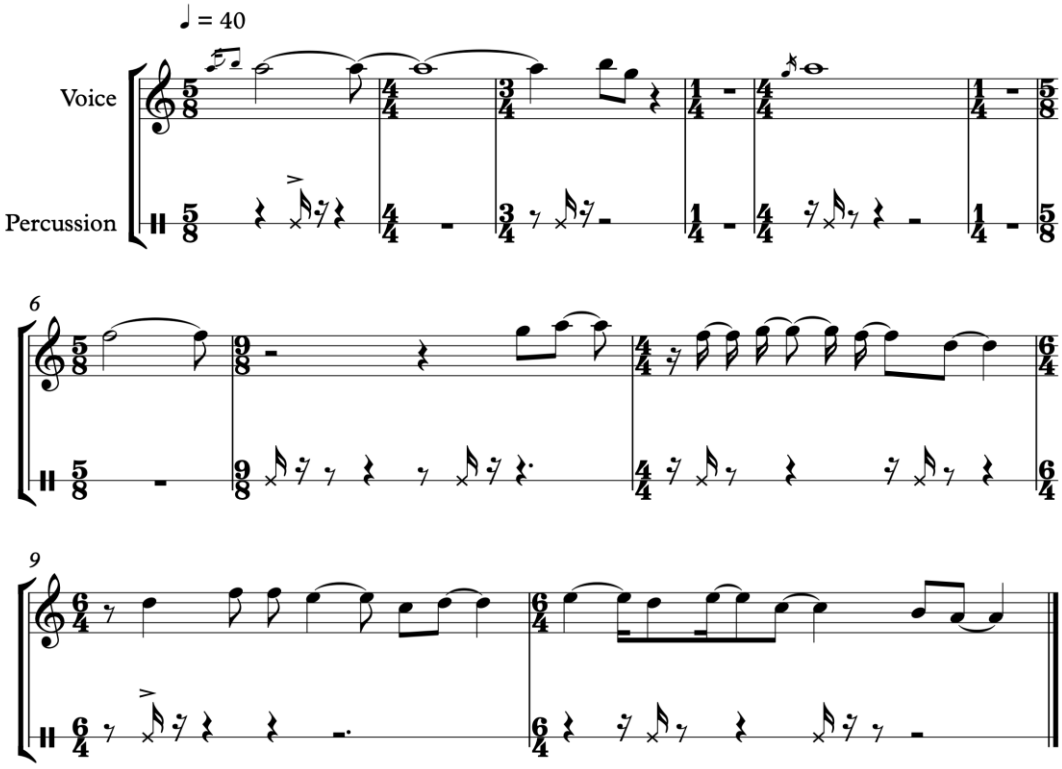

Figure 16 – Transcribed theme of *Froid Est L'Hiver* (冬天寒)

The opening of *Winter Fantasy* is shown in Figure 17. Bars 1-3 are an introductory figure, with bars 4-7 as the first proper phrase. Time durations are mapped into the time structure of the sound object, and translated into staff notation. The time signatures shown on the score are not the original setting of the score from Nanguan, but a comprehensible notation for the quartet performers. The acceleration gesture in the

cello from bar 1 to 3 is a simulation of the Pipa[28] in Nanguan music. This acceleration gesture is commonly seen in the transition section of Nanguan. From bar 4 to 7, I use a high line (written in artificial harmonics) on the first violin, that moves in glissando between quartertones and has gradually changing bow position, to portrait the contour of a vocal melody, but in a very ambiguous approach. The relationship between Nanguan instruments is strongly influenced by the philosophy of Yin-Yang.[29] The relationship of the two violins is according to the concept of Yin-Yang, with interconnection and interdependence. The first violin here acts as Yang, and I use harmonic glissandi above A as fundamental, in the second violin, to act as Yin. The viola and cello also have a Yin-Yang relationship. They play together to portray the time structure and rhythm of Nanguan. The sound of the Nanguan percussion is re-synthesised here by pizzicato in the cello and noise sounds in the viola (Figure 17).

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[28] The Chinese pipa, a four-string plucked lute, descends from West and Central Asian prototypes and appeared in China during the Northern Wei dynasty (386–534).[...]The word pipa describes the plectrum's plucking strokes: pi, "to play forward," pa, "to play backward." https://www.metmuseum.org/toah/hd/pipa/hd_pipa.htm, accessed 10/10/2019.

[29] In Chinese cosmology, Yin and Yang are two opposite but complementary principles that regulate the functioning of the cosmos. Their continuous joining and separation is at the origin of the rise and the disappearance of all entities and phenomena in the world of the "ten thousand things" (wanwu), in which we live. https://www.goldenelixir.com/taoism/yin_and_yang.html, accessed 10/10/2019.

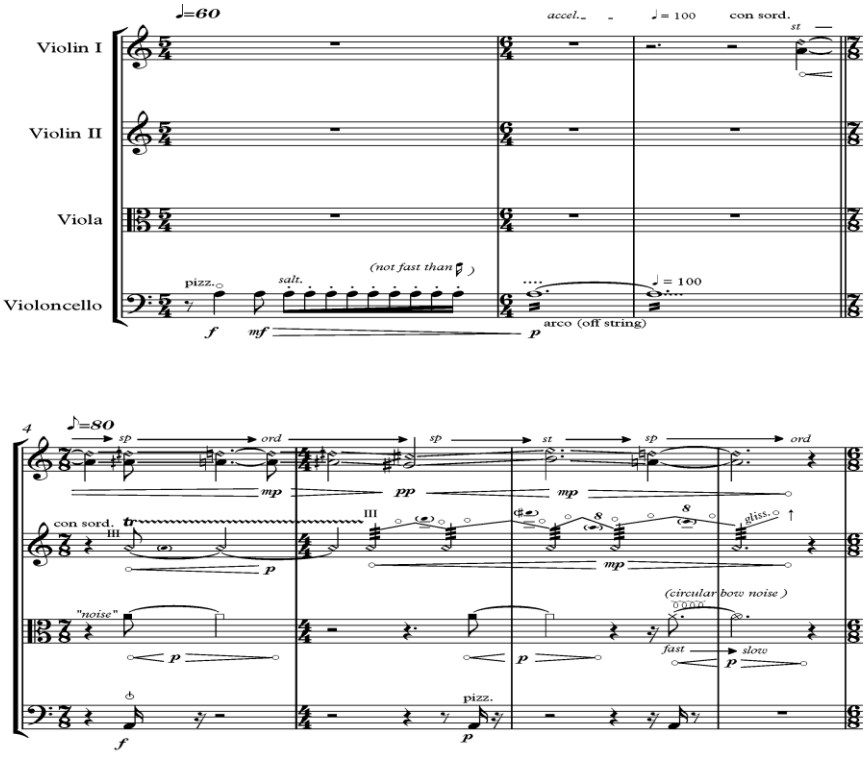

Figure 17 – Excerpt from *Winter Fantasy* m.1-7

Pitch Organization

The approach to pitch organization I use in this work is based on systematic distortion of the harmonic series, to create verticalities, which interact with a horizontal expansion, at structural scale, of the vocal melody from *Froid Est L'hiver*. I used A2 as the fundamental tone, and made a series of distortions in the overtone spacing. For the calculation, I used an online Javascript program written by Michael Norris. It calculates

the frequency of the partials as follows. If f_1 is the fundamental, f_n is the frequency of the nth partial, and s is the scaling factor, then:

$$f_n = f_1 (s(n - 1) + 1)$$

(Norris has subsequently updated the program.[30] In the current version, the calculation is the same if the "Exponent" and "Frequency addition" are set to 1.0 and 0.0 respectively.)

I chose scaling factors of 0.6, 0.7, 0.8, 0.9, 1.0 and 1.1, and labelled the resulting series as A 0.6, A 0.7, etc. All the series are based on A2 as fundamental, but with different partials above the fundamental. The spectral colour of A 0.9 is more close to the original series (A 1.0), whereas A 0.6 is sounds further away from the original. Figure 18 shows the spectra in staff notation, with the frequencies rounded to the nearest equal-tempered quarter tone. I use this principle to define the relationship of each section of the composition to the original object.

[30] Michael Norris, *Harmonic Series Calculator*, http://michaelnorris.info/theory/harmonicseriescalculator, accessed 24/04/2019.

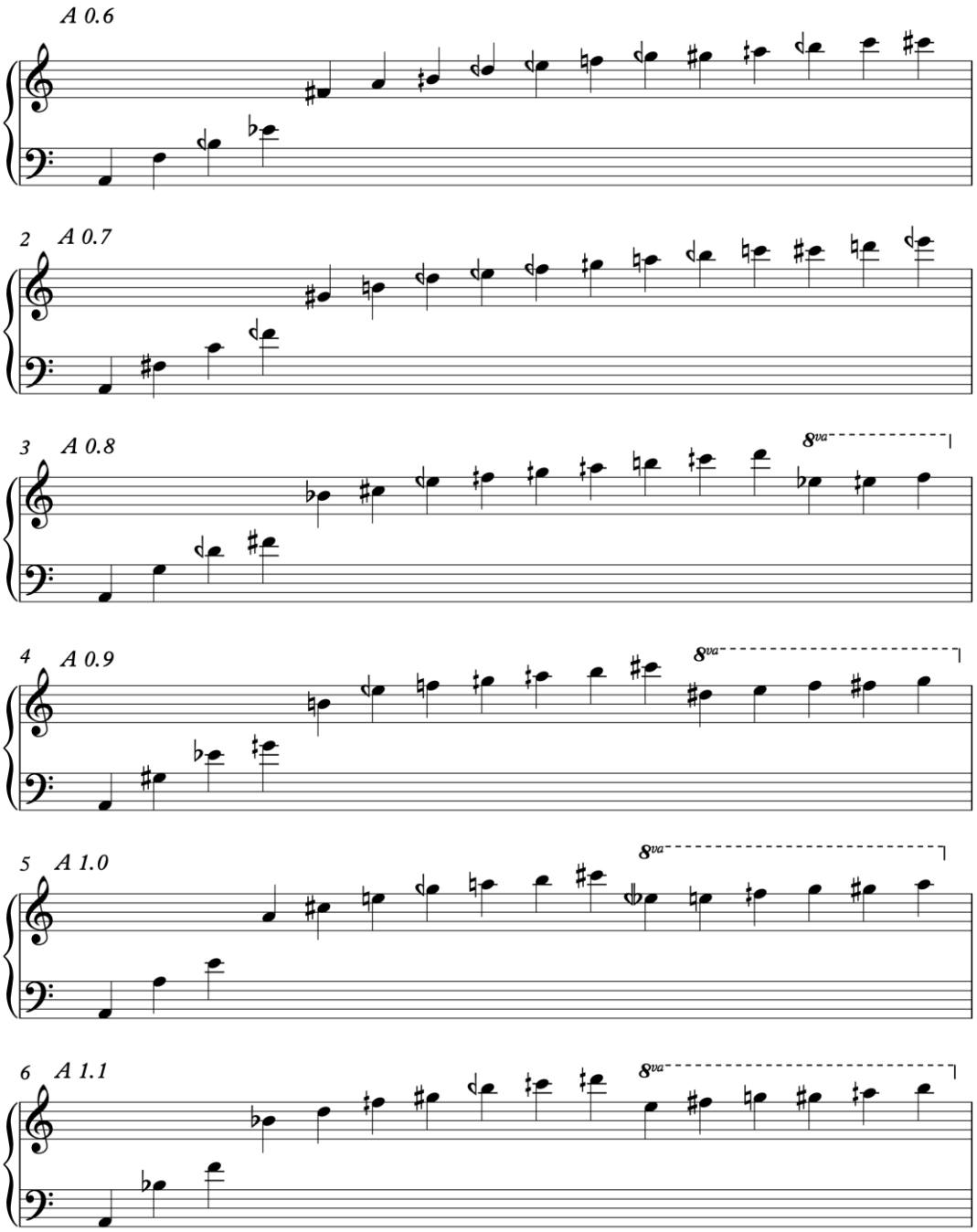

Figure 18 – Spectral distortion on pitch A

The vocal melody of *Froid Est L'hiver* is transformed into different morphologies throughout the piece. The outline of the melody, which moves from A to D, serves as the pitch structure of the piece as a whole. The whole piece can be seen as a variation

of that initial object, underpinned by a transformation from the spectrum on A, at the start of the piece, to the spectrum on D at the end. I wanted to create the possibility of continuous transformation by using microtonal pitch materials. The harmonic distortion methods creates slightly different spectral colour from one to another, but based on the same fundamental tone. I use these materials to transform from one section to another by using common tones to pivot between different spectra. I also use harmonic juxtaposition to transform from spectrum A to spectrum D: from m.87, the spectrum is set up as A1.0, while the upper partial of spectrum D 0.9 gradually comes in from m.93. The pitches are derived from the two spectra mixed together, becoming totally transformed to D 0.9 in m.95.

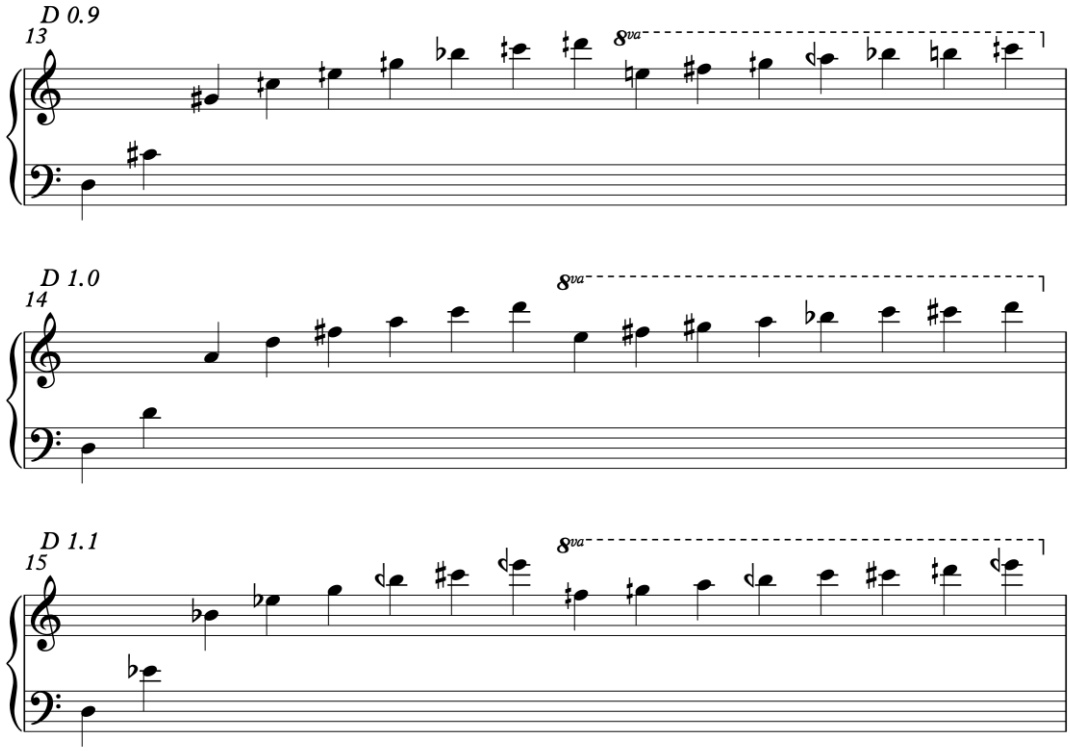

Figure 19 – Spectral distortion on pitch D

Texture

The textural quality of Nanguan music is another aspect I wanted to explore in *Winter Fantasy*. In Nanguan music, there is no harmony and counterpoint. Each instrument plays the same melody, with freely added ornamentation, which results in a heterophonic texture.

For instance, from bar 36 to 39, the second violin and viola all play on D. A texture is created by different ornaments, dynamics, articulation, and phrasing but based on the same note (Figure 20).

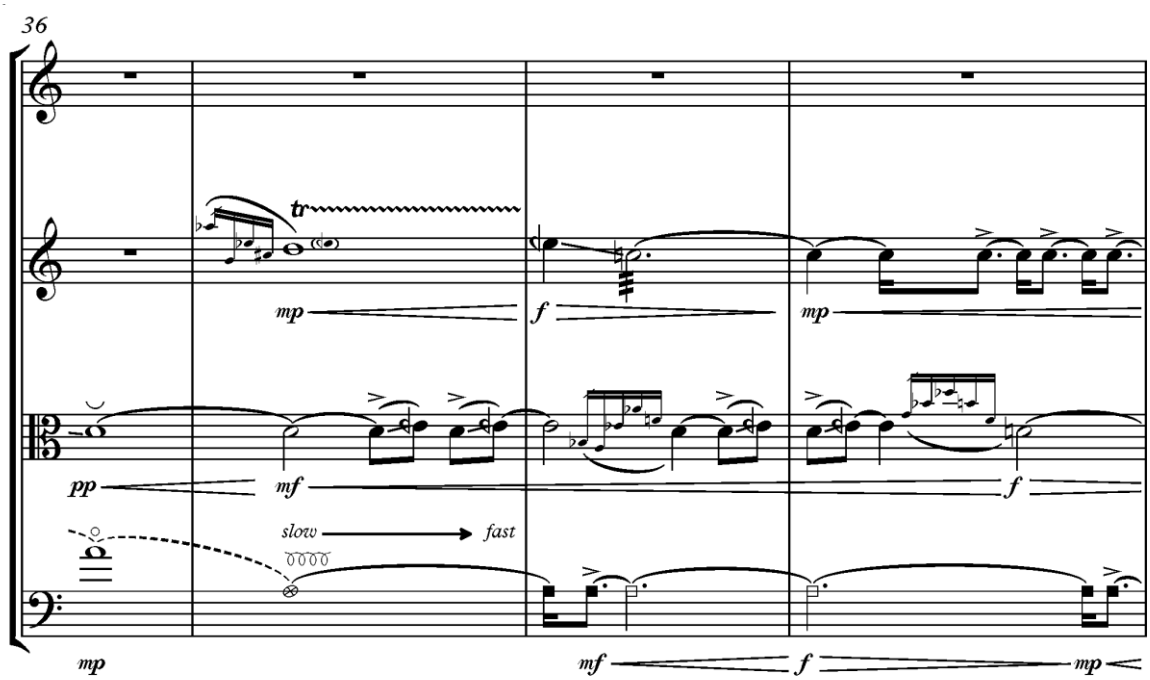

Figure 20 – Excerpt from *Winter Fantasy* m.36-39, heterophonic texture

Chapter 4 – Voice and Beiguan in *Breeze through Pines*

In continuation from the Winter Fantasy, I wanted to develop the spectral approach by adding rhythmic elements. This piece was inspired by Chao, Ching-Wen's work: Tsang Tse (2010) for mixed chorus with percussion obbligato, which uses a Beiguan percussion sound produced by the chorus.

This piece is inspired by "Beiguan" music. "Beiguan is one of the dominant traditional music genres in Taiwan. "Bei" means "north", however, insiders also use it to refer to a style of loud and strong music. It has a huge scope that consists of percussion and wind ensemble music, silk and bamboo ensemble music, theater music, and refined songs."[31] *Breeze through Pines* starts from whispered voices which imitate the percussion sounds, and the piece then transforms in different layers of its overall structure. The variation of gesture, texture, and rhythmic materials grows bigger and bigger throughout the piece.

After completing *Winter Fantasy*, my attention became drawn to the issue: how can the rhythmical elements such as gongs and drums in Beiguan be integrated within my concept of sound? How might I maintain the most important qualities of the cultural elements, but not fall simply into reproduction of the old sound? How could I construct a structural process that included the rhythmical elements, in a natural approach,

[31] https://trd-music.tnua.edu.tw/en/TrdMusicDep/theory/Pak_koan, accessed 17.5,2019.

without the problem of the music seeming to be divided section by section when we perceive the work as whole?

Structure of the Piece

Before composing, I designed the overall structure of the piece according to sections A to F. The duration of each section expands gradually, until the final section (F) which is again short. The idea of this structure is a process which brings in more and more materials, and as they accumulate, the variations of material are rolled together into further levels of transformation. Materials within each section (noise, voice, rhythm, etc.), and the relationship of the materials are also described in keywords, as shown in Table 1. In the score, rehearsal letters B to F correspond to the start of their corresponding structural section. The transformations of each section are inspired by spectral thinking.

Table 1 – Structure of *Breeze through Pines*

Pitch Organization

The pitch conception of this piece is also based on the harmonic series, as in ***Winter Fantasy***, but extending the distortion and transformation. The piece starts from unpitched noise material, then introduces the pitch-centre G, and gradually transforms into A. The material for the pitch variation is based on altering the original harmonic

	Duration/ Timeline	Measure	Material	Relationship	Spectral Process	Pitch centre
A	44’’ / 44’’	m1-15	Noise Voice Rhythm	Short-long phrasing with speed variation	Noise	N/A
B	53’’/ 1’37’’	m16-36	Noise Voice Rhythm	Timbral variation of section A	Spectral set up	G-C# harmonic/ G1.0
C	1’24’’/ 3’02’’	m37-65	Voice Gesture Texture	Time Stretch Texture and register expanded	Spectral distortion	G1.1 → G1.0 → G0.9
D	2’15/ 5’16’’	m66-138	Rhythmical interlude Melody	Mirror structure inside section D	Spectrum transform	G0.9 → A1.1
E	2’30’’/ 7’46’’	m139-208	Big texture Including noise, voice, and rhythm	All materials mix together	Spectrum transform	A1.1 → A1.0 → A0.9
F	48’’/ 8’34’’	m209-231	Rhythm Gesture Melody	Coda		A1.0

series by harmonic distortion (Figure 21 and Figure 22), and transformation at different levels by shifting focus within the series and modulating the pitch center. I expanded this model into two fundamental tones in order to create both colour and distance within the same fundamental, and also to create directions for movement and a network between different fundamentals. The transformation of pitch material is gradual from the original harmonic to the distorted harmonic series, which creates sonic tension from consonant to dissonant gradually instead of the traditional modulation of functional harmony.

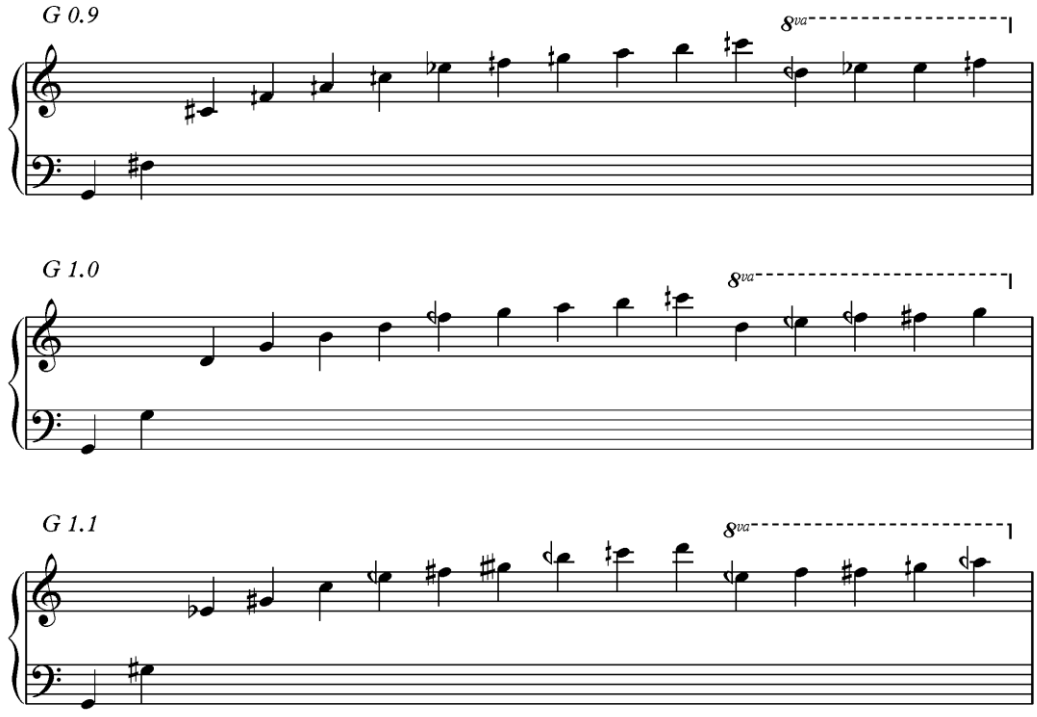

Figure 21 – Spectral distortion on pitch G

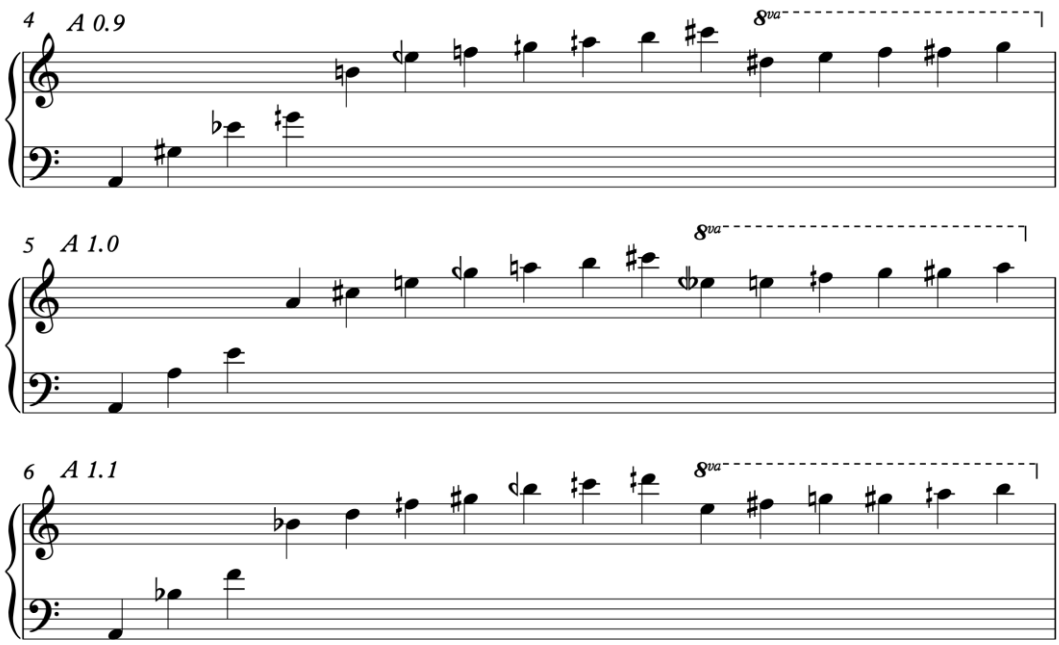

Figure 22 – Spectral distortion on pitch A

Vocal Material

In traditional Beiguan music, words representing the sound of various percussion are used as notation. The pronunciation of specific Chinese words imitate different percussion sounds and their associated performance methods. Figure 23 shows the traditional representations.[32] The first column is the list of different percussions, the second column is the notation of the sound in Chinese words, the third column is the sounding of the word in English. In Beiguan music, the traditional learning process is done by verbal instructions. The Chinese words function as symbols of the percussion

[32] Hsieh Tsung-hsin. Perfomance Technique of Chao-zhou Big Gong-Drum Music, p.55, Chinese Culture University, department of music, master thesis, 2004. https://hdl.handle.net/11296/yc7yzp

sounds, and the pronunciation of these Chinese words in everyday language may be slightly different from the percussion notation, according to regional dialect.

使用樂器	*鑼鼓經*	*唸讀音*
小鈸單擊	七	ci
月鑼、亢鑼	丁	die
小鈸、月鑼、亢鑼	青	chie
斗鑼、亢鑼、月鑼	喬	giao
欽鑼	空	kong
深波、蘇鑼	沖	chong
蘇鑼	坑	kuang
深波擊邊	乾	king
斗鑼、大鈸	晴	zie
小鈸、大鈸 亢鑼、月鑼	查	cie
小鈸、大鈸、亢鑼 月鑼、深波、欽鑼	倉	cang
斗鑼+其它樂器	壯	zhang
所有樂器閌擊	仄	zie

Figure 23 – Percussion notation of Beiguan music

Growth of the Piece

The sound of the percussion is whispered by the instrumentalists to imply the Beiguan soundworld at the beginning of the piece (Figure 24), and is followed by non-pitched noises made by strings and (real) percussion. The relationship of the vocal percussion sounds and the instrumental noises is structured into short-long phrase units (e.g. m.1 short, m.2 long; m.3 and m.4-5; etc), and varied in different metre combinations in section A. The “Beiguan” element here can be seen as analogous to a “sound object” in electroacoustic music: transformation of the original timbre into sound-as-itself creates an exploratory space in the music, which enables the composer to hybridize other musical elements together without compromising their underlying character. Although

the timbre is transformed away from its original quality, the internal sound character still keeps a certain connection to the original source. It aids the unity of the whole piece and the potential of variation in the following development.

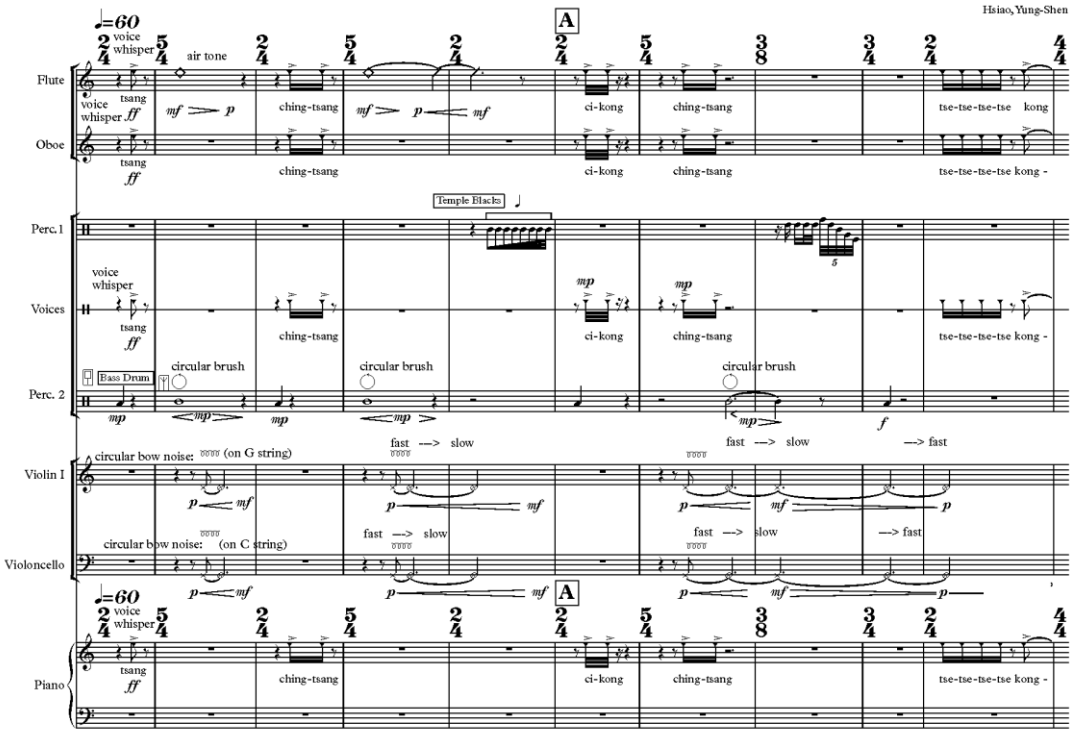

Figure 24 – Excerpt from *Breeze through Pines* m.1-10

In section B, the phrasing structure from section A continues and is varied in rhythm, timbre, pitch, speed, and gestural aspects. The spectrum G1.0 is established, with a focus on the pitches G and C#(with C# standing for 11th harmonic of G). The pitch element comes in m.28 with piano on G, and C# on flute and violin. The process of transforming noise to pitch begins here with synthesis of muted piano, violin harmonic and flute trills. The transition from section B to C recalls several rhythmic gestures in different layers, each using semi-improvisation within a shared time frame (Figure 25).

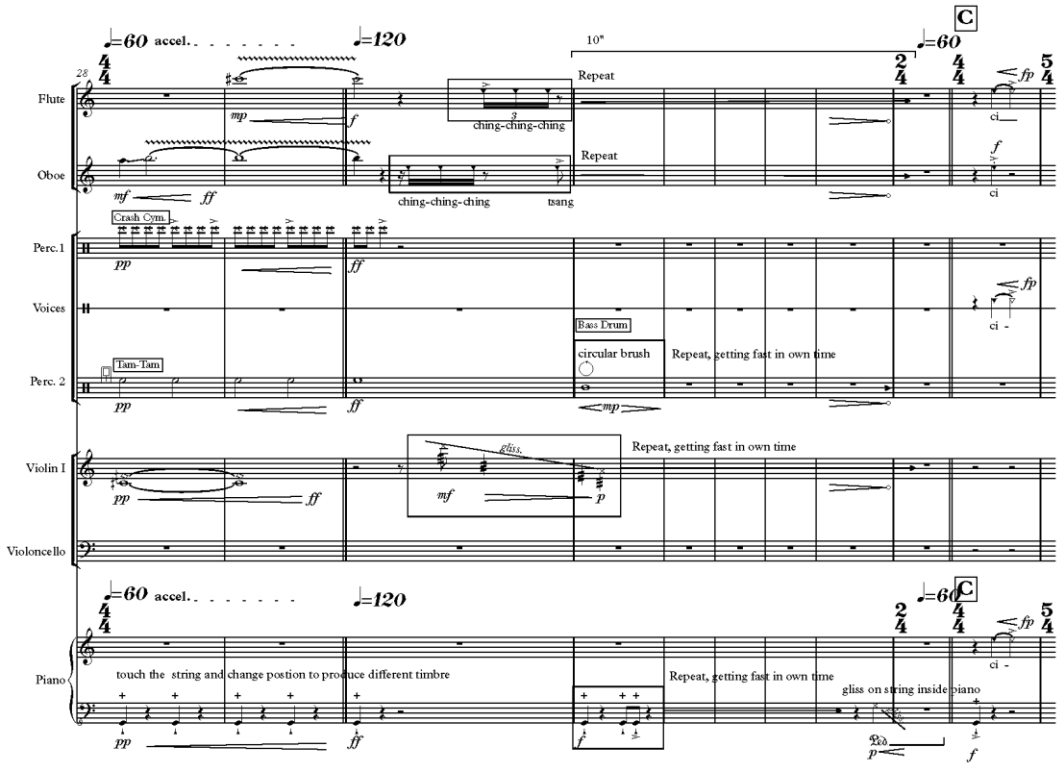

Figure 25 – Excerpt from *Breeze through Pines* m.28-37

In section C, the phrases expand into a longer texture, while still keeping the short (m.46-47), long (m.48-53) phrasing structure (Figure 26). The concept of time-stretching from electroacoustic music is borrowed here, to create musical texture by stretching out the original source. The small gestures and spectral content can be heard in detail, while keep the same timbral quality inside the whole texture. Pitches shift gradually from G 1.1 to G 0.9.

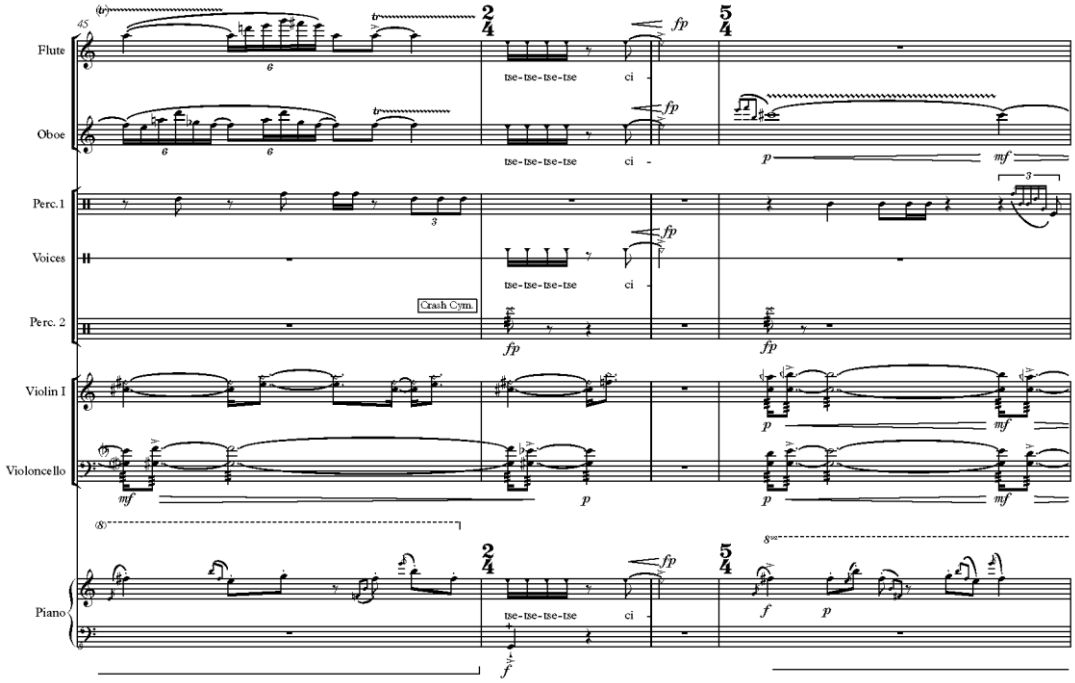

Figure 26 – Excerpt from *Breeze through Pines* m.45-48

In section D, the rhythmical character of Beiguan is gradually revealed in the instrumental percussion part. In Beiguan music, the percussion often plays an important role in controlling the musical structure: rhythmic interludes intervene occasionally to vary the meter or speed, and to bring the ensemble to another section. I designed a symmetrical structure within section D. It contains a repeated rhythmic pattern in the full ensemble m.75-80 (Figure 27), which returns at m.125-9. Before the first of these, the rhythm has an accelerating quaver and semiquaver pulse; after the second, a similar motor slows down. The short rhythmic gesture from the first repeating block is extended into a polyphonic texture which contains rhythmic gesture, vocal percussion, and melody. In the middle part of this section, timbral elements come in to transform the spectral material from G0.9 to A1.1. A figuration reminiscent of wind chimes, in

the piano's high register, brings in a tone-colour morphing in the woodwind, microtonal shimmering sounds in the strings, and the continuing explicit rhythmic material imitating Beiguan. The pitch material morphs gradually through this process, and the repeated block intervenes again at m.125, after the transformation of spectral centre.

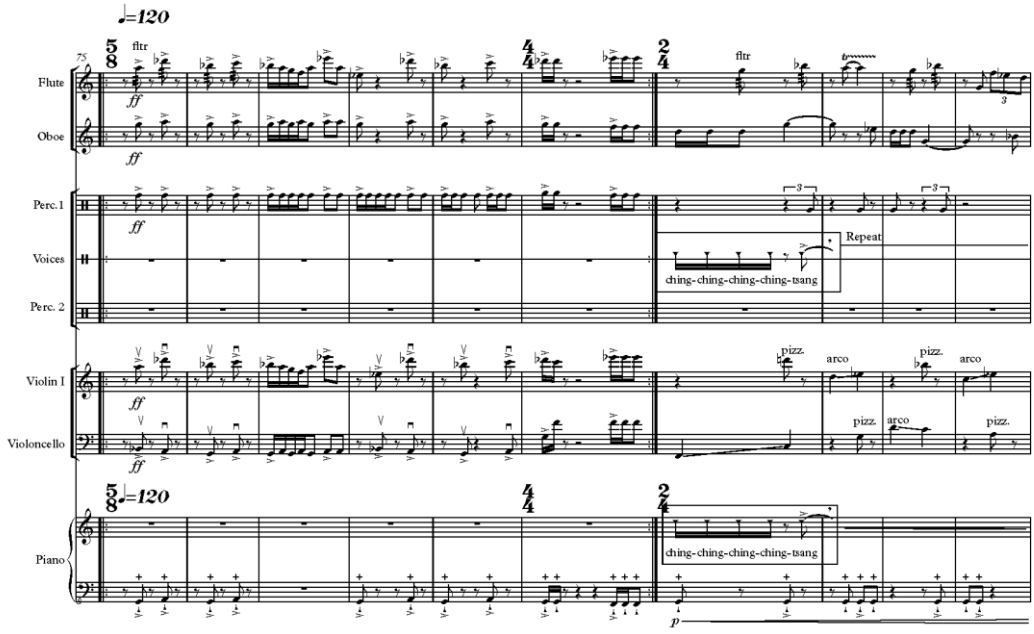

Figure 27 – Excerpt from *Breeze through Pines* m.75-84

In section E, all the materials are integrated within a more complex texture. It retains the profile of the original phrasing structure, but the duration, density, and the saturation of timbre grow towards the most extreme intensity of the whole piece. The "Beiguan" percussion in voice is revealed from m.183, connected now rather than fragmented, and creates a vocal texture by allocating different percussion sounds to the woodwind and percussion performers (Figure 28). The vocal texture plays a role, as in Beiguan percussion, of pushing the music forward, and also acts as a contrasting part within the

larger texture. The spectral materials are gradually transformed while remaining on fundamental A (A1.1 → A1.0 →A0.9).

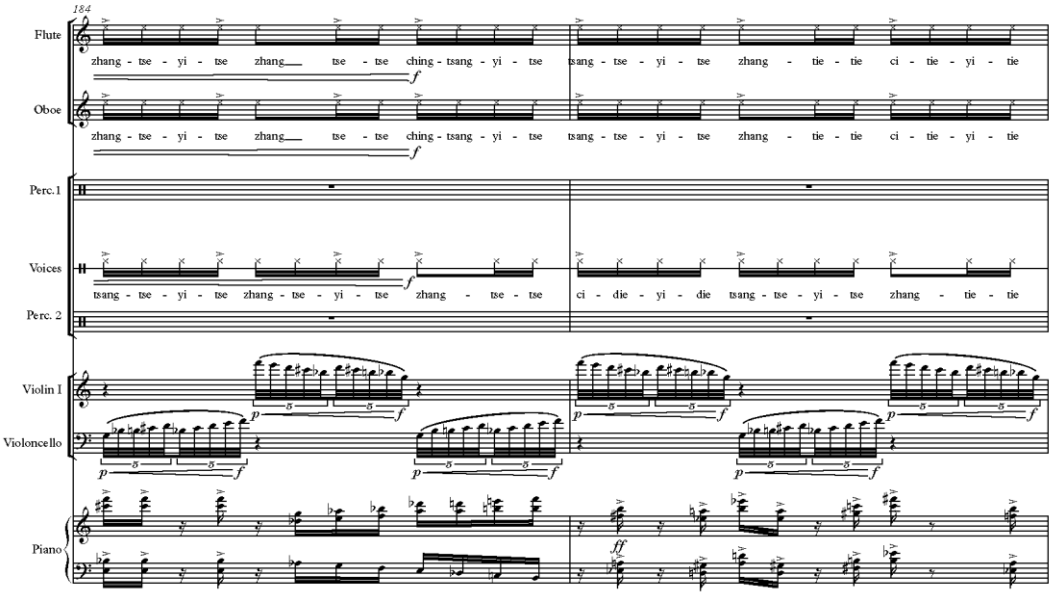

Figure 28 – Excerpt from *Breeze through Pines* m.184-185

Section F serves as a Coda, but it also, for the first time in the piece, reveals the complete melody of "Beiguan" style music from m.221 to the end (Figure 29). The rhythmic texture is recapitulated from m.209 in the full ensemble, then combines percussion with a return of the swirling string gestures from section E, to lead to the final declaration of the Beiguan melody in the woodwinds.

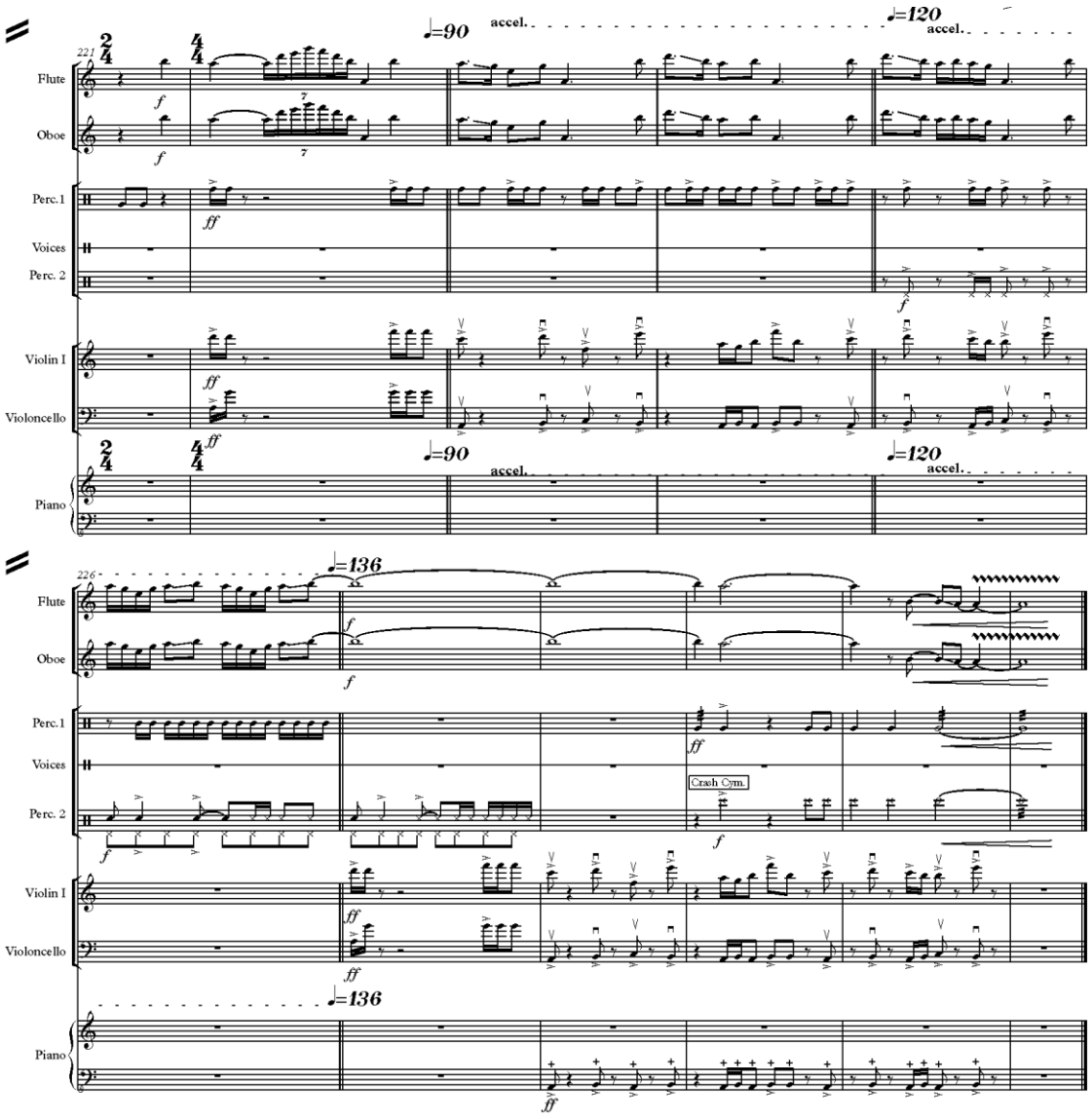

Figure 29 – Excerpt from *Breeze through Pines* m.221-231

Developmental process of transitions

Beside the development of materials within each section, I also designed the transitions of each section conceived as a sound object. The sound objects expand from simple to complex, as the intensity level rises in each successive section. The variation of transitions are listed as below:

Section A to B (m.13-15): Tempo change from 60 → 120.

Section B to C (m.28-36): improvisation with gesture, tempo change from 60 → 120.

Section C to D (m.54-65): improvisation with gesture and texture, tempo change from 60 → 120 → 60 → 120.

Section D to E (m.131-138): improvisation with gesture and texture and rhythm.

Section E to F (m.193-208): improvisation with gesture and texture, rhythm, tempo change from 60 → 120.

Chapter 5 – Poetic Imagery in *October's Opal*

I attended Chen, Qigang's composition workshop before I wrote this piece. It was not inspired by any specific piece of music, but was influenced by Chen's approach to creating music. I tried to rediscover my inner intuition without thinking about theory. This piece focuses on expressing a sound image and the emotion I felt when reading a poem.

This work takes inspiration from the short poem *October's Opal* by Robert Savino.[33] The poem is reproduced in full in the score, by kind permission of the poet; the beginning and end are excerpted below. When I wrote the piece, it was in October and I was flying back to Bristol. The image of autumn was vivid surrounding me, the colours, wind, maple trees, the sounds of nature and the temperature that I felt, and the sense of time passing, as the poem illustrates:

> October is here, once again,
>
> Barely transcending the threshold of autumn.
>
> The maple is turning yellow to orange, to red,
>
> Soon to be bared by winter.

[33] http://www.robertsavinopoetlaureatesuffolkcounty.com/more-poetry.html, accessed 26/04/2019.

I wanted to write a piece that was not so much involved in sophisticated theory, nor in the explicit cultural elements, as the approach I used in previous works. Instead I sought to capture the state of mind I can sense in the poem, and the real experience in that moment.

…Our chest fills with laughter.

When apart, even so brief,
This season stays with you,
Whether I am or not
And your voice with me,
Through wind's immutable breath.

I used intervals of the fourth to construct the whole piece, both in harmony and melody. The piece starts from a pulsing chord on piano accompanied by cello on high A harmonic. With the introduction of leap of 7^{th} on piano and flute, the melody on clarinet comes in, also combining fourths (Figure 30). Along with the sustaining of the melody, a "wind" theme on piano, with four against six cross-rhythm and varied tempo, completes the introduction section.

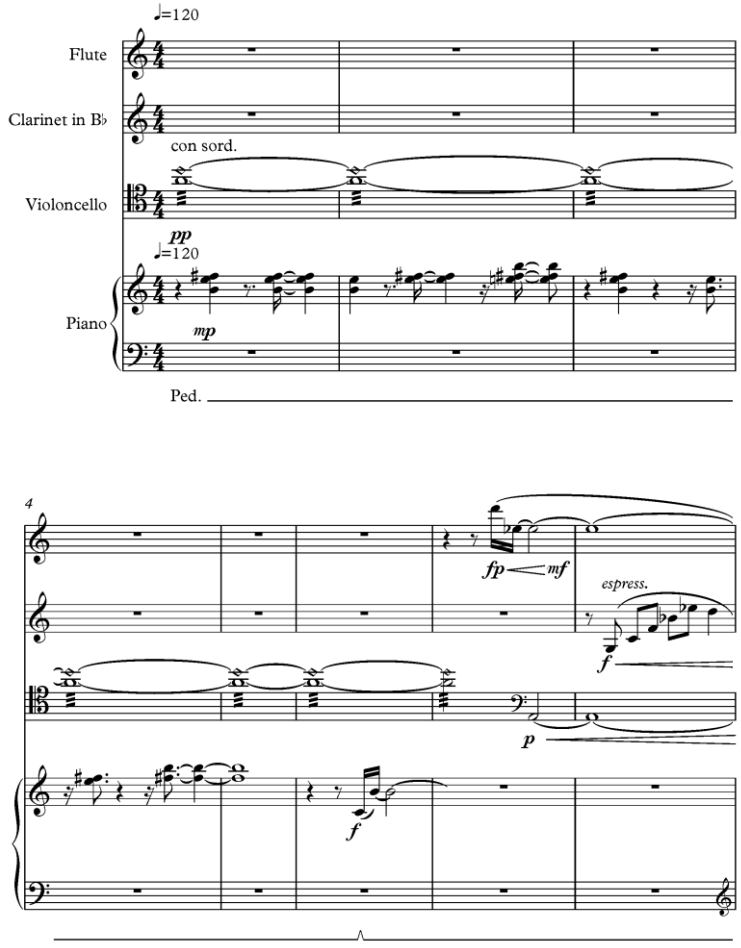

Figure 30 – Excerpt from *October Opal* m.1-8

From m.13 to m.38 is a development of the fourth-interval melody on flute and clarinet. The piano and cello act as background texture and colour. I use voices whispering "mu-shi-mu-shi" like the rustling of leaves, to suggest the sound of autumn in m.37 to m.38, accompanied with the wind theme on piano again (Figure 31).

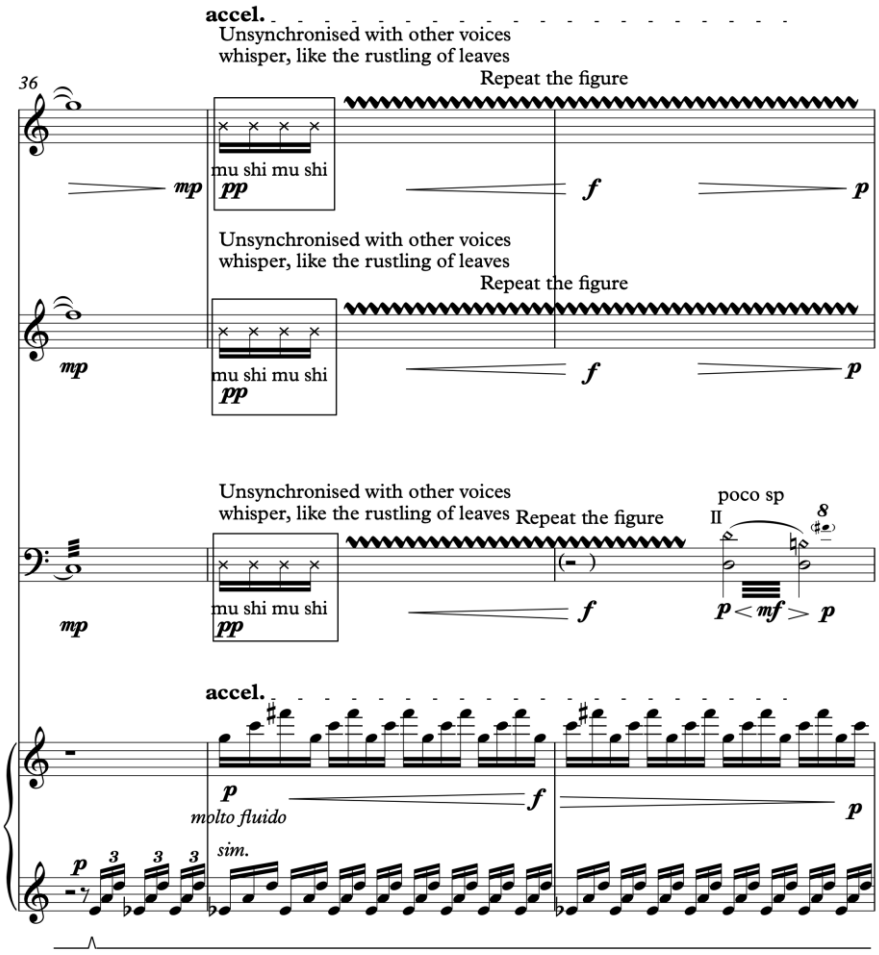

Figure 31 –Excerpt from *October Opal* m.36-38

As the music goes forward, the colour of the harmony changes as in the poem: “The maple is turning yellow to orange, to red…”. From m.39 to 53, the melody is transformed into an ensemble texture. The melody-harmony relationship becomes blurred, many elements going forward simultaneously and synchronised as a collective sound, until the wind theme comes in again on flute and clarinet in m.53.

From m.54, the wind theme is transformed into rhythmic and energetic phrases on cello, and their counterpart on flute then clarinet, with strong accented interjections from the piano (Figure 32).

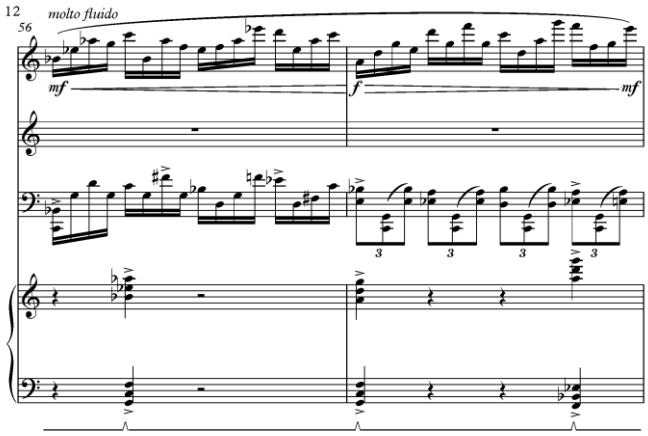

Figure 32 – Excerpt from *October Opal* m.56-57

The semiquaver patterning is repeated and then stops, in m.61, before triplet phrases start at m.62. There are several different value of triplet juxtaposition in cello, clarinet, and flute (Figure 33).

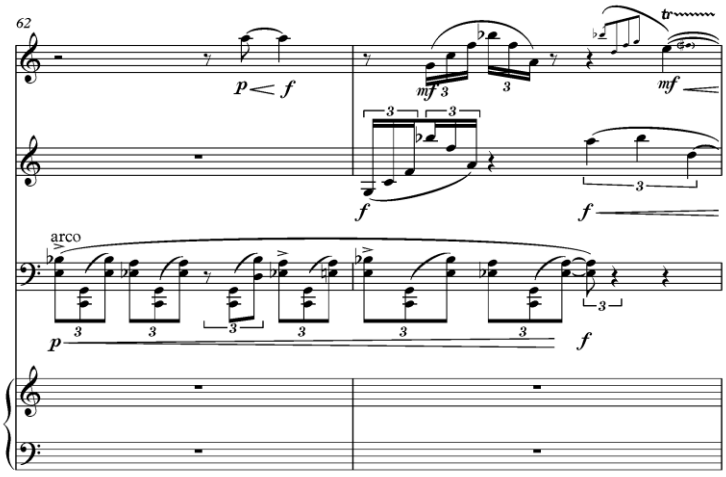

Figure 33 – Excerpt from *October Opal* m.62-63

The piano reappears quietly in m.67 to recall the material of the introduction, along with figuration in the other instruments (Figure 34). The wind theme in m.72-73 acts as a bridge to the following development section.

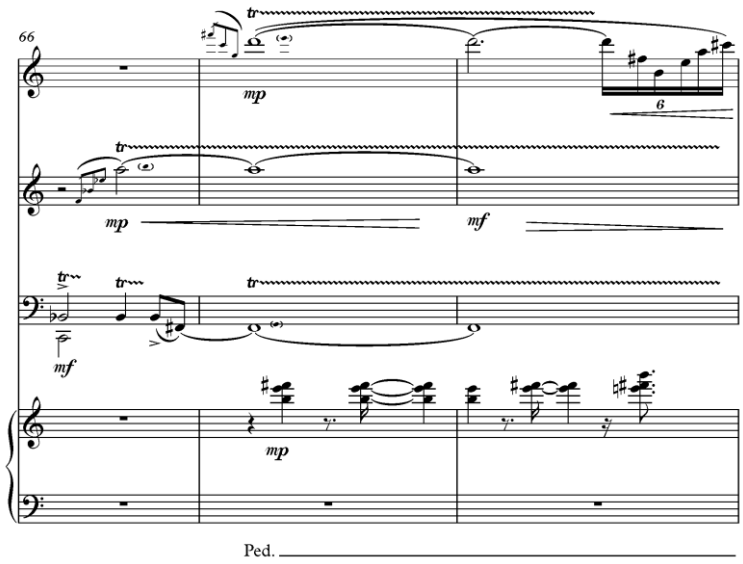

Figure 34 – Excerpt from *October Opal* m.66-68

The triplet material continues to develop in this passage. The arpeggiation technique and harmonics on cello are mixed with the transformation of timbre by moving the bow position between sul tasto and sul ponticello (Figure 35).

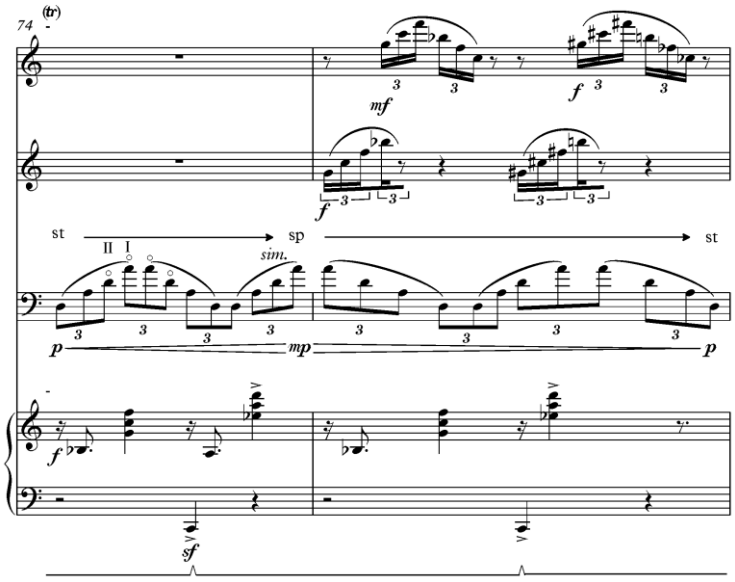

Figure 35 – Excerpt from *October Opal* m.74-75

M.85 to m.99 is a transition to the ending section, with the fourth-melody recurring on clarinet and its counterpart on flute, and the background made by cello and piano carrying forward patterns from the previous section. The wind theme and voice sounds appear in m.97, for the last time, as a bridge to the start of a cello solo. I use artificial harmonics on cello to perform the melody from m.101, and spaced registers of right and left hand on piano, to produce a sense of space. The lyrical melody from m.108 on cello integrates with the sound of flute and clarinet, which produce an oscillating effect in the middle register. From m.117, one performer acts as speaker and recites the poem accompanied by the piano's gentle pulsing: "October is here, once again, barely

transcending the threshold of autumn. The maple is turning yellow to orange, to red, soon to be bared by winter…”

Chapter 6 – Extended Techniques of Timbre in *Mystery of Nature*

This piece was commissioned. I didn't study any similar musical pieces before writing it. In retrospect, I see that the sound world of this piece was unconsciously influenced by Takemitsu's work Toward the sea (1981) and the concept of nature. I wanted to create musical scenes to express the nature and philosophy of silence.

Mystery of Nature, a duet for flute and guitar, was commissioned by Flaugissimo Duo.[34] The work is in four episodes: *Night Sky, Wind and Waves, Dancing Rain, Monologue.* Each episode represents a different scene and image. Although in different character and using varied techniques, they all share one pitch resource – the harmonic series on E (Figure 36). In this piece, I wanted to explore extended techniques on flute and guitar, and a "static-dynamic" relationship between different episodes. I prefaced each episode, in the programme note to the score and reproduced below, with a few words of poetic imagery.

> *I. Night Sky Stars twinkling, stars shining; Stars unveil mysterious sights that darkness covers in the night sky.*

[34] http://www.flauguissimoduo.com/, accessed 17/5/2019.

II. Wind and Waves I am the wind. you are the wave; You and me, go together.

III. Dancing Rain Tiny raindrops falling in rhythm, becoming the music we are dancing.

IV. Monologue Looking at the stars in the twilight sky. Listening the sound of silence.

The shape of the piece as a whole can be described as static – dynamic – dynamic – static.

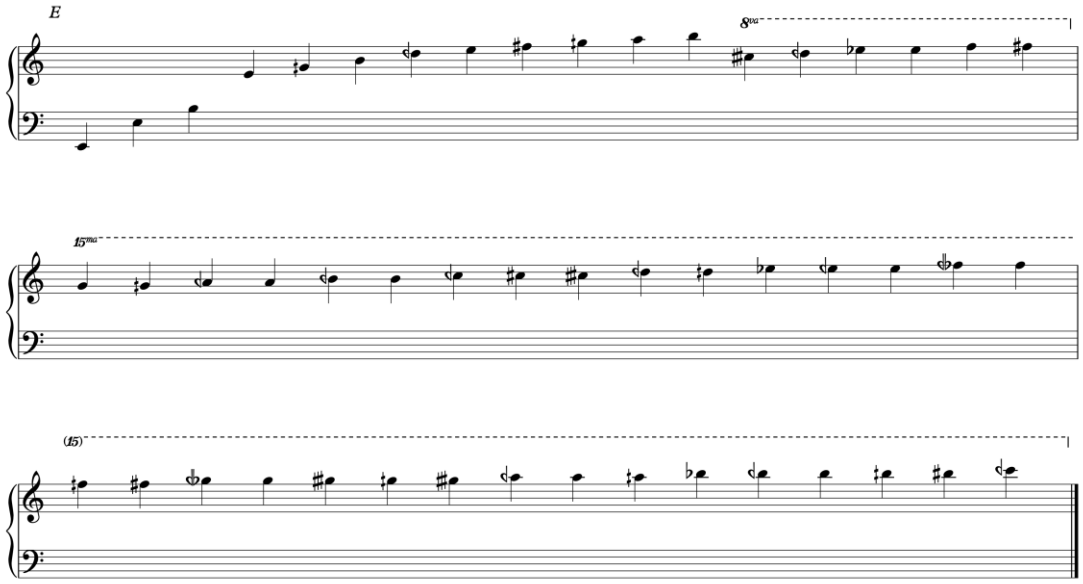

Figure 36 – Harmonic series on E

Night Sky

Stars twinkling, stars shining;

Stars unveil mysterious sights that darkness covers in the night sky.

The piece starts from a flute solo, combined with the player's voice at the phrase-ends. The voice pronounces vowel sounds such as "wu" and "a" to mix with the flute sound, and with their own dynamics, to create special timbres. The first two phrases of flute are played with "Aeolian sound", which creates a coloured air tone compared to the normal flute (Figure 37).

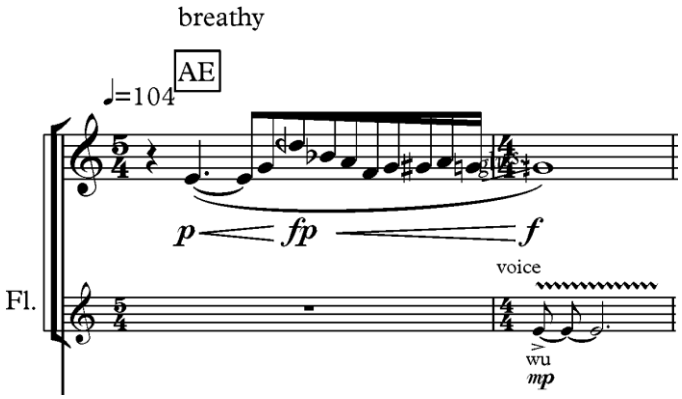

Figure 37 – Flute solo, excerpt from *Night Sky* m.1-2

I wanted to create a melody with delicate timbre variation, controlled by instrumental techniques such glissando, continuous dynamic changes, microtones, accents, and vibrato. The phrases are not only a melody constituted of notes, but also are complex sound entities.

A contrapuntal relationship of flute and guitar runs through the piece. The guitar enters in m.9 functioning as an echo of the long flute note on G quarter sharp. The melody lines, chords, arpeggios, and glissando, are used freely to support the flute part (Figure 38). I also use natural harmonics on guitar to colour the pitch space.

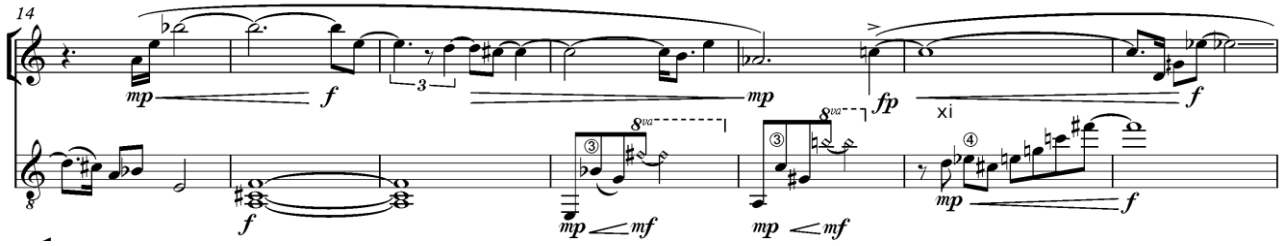

Figure 38 – Excerpt from *Night Sky* m.14-20

Natural harmonics are also used to create multiple voices, such as in m.28-30 (Figure 39). The long release character is useful when I want to create a more complex texture. The middle voices can be played while the harmonic on beat one is still vibrating; the second natural harmonic can be played while the low register note is sustained.

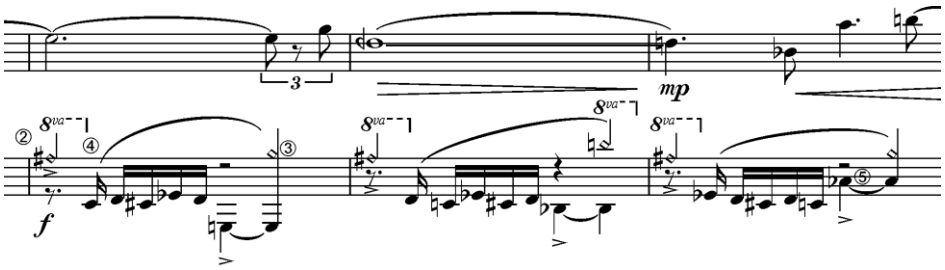

Figure 39 – Excerpt from *Night Sky* m.28-30

The flute explores its register higher and higher until the climax on high E in m.44, which is initiated by the grace note an octave lower and has irregular vibrato with dramatic dynamic shaping. The flute player is asked to improvise an unstable vibrato in order to create timbre that varies through time. The guitar sings its melody line quietly from m.37, mixed with harmonic pitches, and strums strongly and rhythmically in m.42 to create tension and help the flute prepare to reach its high point by building the harmonic spectral ground in m.43 (Figure 40).

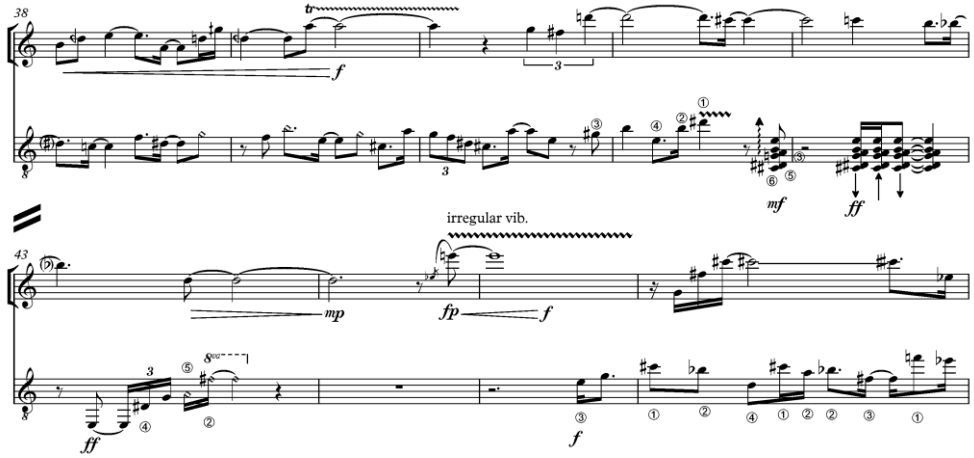

Figure 40 – Excerpt from *Night Sky* m.38-46

Wind and Waves

I am the wind. you are the wave;

You and me, go together.

This episode starts from guitar (Figure 41). The first chord E, G, Db, F# is sustained both by the long release tone of the low E, and vibrato on the fingered pitches. The artificial harmonics in m.51 are played within the sound of the first chord. In contrast to natural harmonics, the artificial harmonics on guitar are controlled by stopping the notehead pitch with the left hand, and using the right hand to touch the octave node while plucking, to sound one octave higher than the written notehead (shown by the 8va sign)., Left-hand vibrato on the C# in m.51 connects it to the triplet. The triplet A and G# are connected by a short slide. The grace note D in m.53 is played with "Bartok pizzicato" on open string four, then the E is stopped on the same string and slid to high

register, with the phrase ended by a natural harmonic on the second string. The flute comes in with that guitar harmonic, an octave higher, and extends the tone by dynamic shaping and vibrato. The phrase shape is created by multiple techniques on the guitar, and concerned with the continuous movement of timbre.

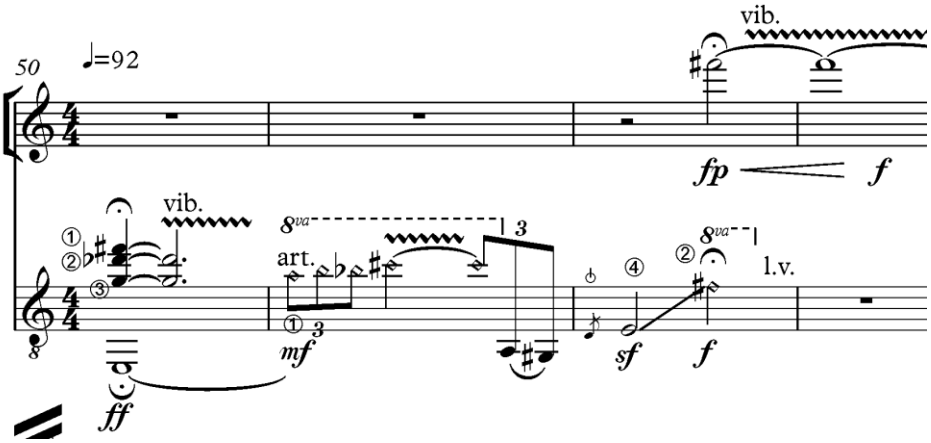

Figure 41 – Excerpt from *Winds and Waves* m.50-53

The second phrase in m.54-57 (Figure 42) introduces a stable and rhythmic motive created by the guitar, in contrast to its first phrase which focused on the timbral aspect. The guitar plays in low register single notes then a triplet of parallel barre chords, and a natural harmonic chord. The last chord again synchronizes with flute high F#.

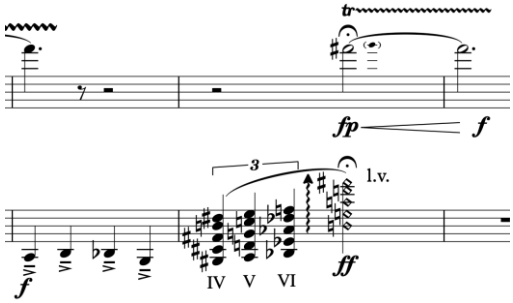

Figure 42 – Excerpt from *Winds and Waves* m.54-56

M.57 to m.59 is a call and response process between flute and guitar formed by wave-shaped gestures of speeding and slowing groups. The overall tempo also changes dynamically from m.58 to m.59. At the end (Figure 43), the guitar motive appears again, but a semitone higher than before, to complete the phrase.

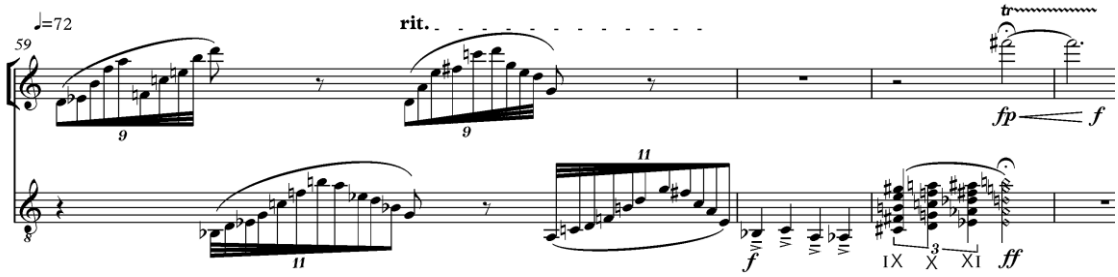

Figure 43 –Excerpt from *Winds and Waves* m.60-62

Flute and guitar play in octave unison then parallel compound fourths from m.66 to m.67 (Figure 44). The triplet segment of the guitar motif appears here, to connect two different sections, ending the unison phrase and starting the new phrase at m.69.

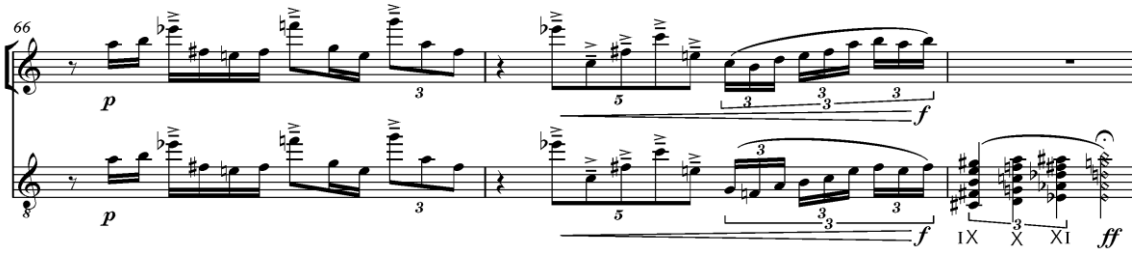

Figure 44 –Excerpt from *Winds and Waves* m.66-68

The relationship of flute and guitar continues to rotate in the shape of wind and wave, but within a gradual speed change from m.69 to m.71. The duration of each phrase, and the morphology of the textural envelopes, are also varied, while retaining a common sense of the original material inside each phrase until the end of piece.

Dancing Rain

Tiny raindrops falling in rhythm, becoming the music we are dancing.

I explore new extended techniques in this episode in order to enrich the timbral and pitch-space possibilities of the guitar. The piece has a continuous "allegro" momentum and sense of rhythm throughout, while the guitar plays its main role in the variation of sound texture. Using techniques of bi-tone,[35] mute, slide, bending, fingerboard hitting, RASG (Rasgueado),[36] and glissando, expands the guitar sound into that of a small ensemble which includes pitch, rhythm, harmony, and timbre inside each phrase. Figure 45 illustrates a range of these techniques.

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[35] Bi-tone: "when a string is made to vibrate by hammering-on two notes emerge – one from the length of the string between the fingered fret and the bridge, and one from the length of string between the fret behind the left-hand finger and the nut. This second note is bi-tone." John Schneider, The Contemporary Guitar (Berkeley: University of California Press, 1985), 126.

[36] RASG (Rasgueado) is a guitar finger strumming technique commonly associated with flamenco guitar music.The rasgueado is executed using the fingers of the strumming hand in rhythmically precise, and often rapid, strumming patterns.

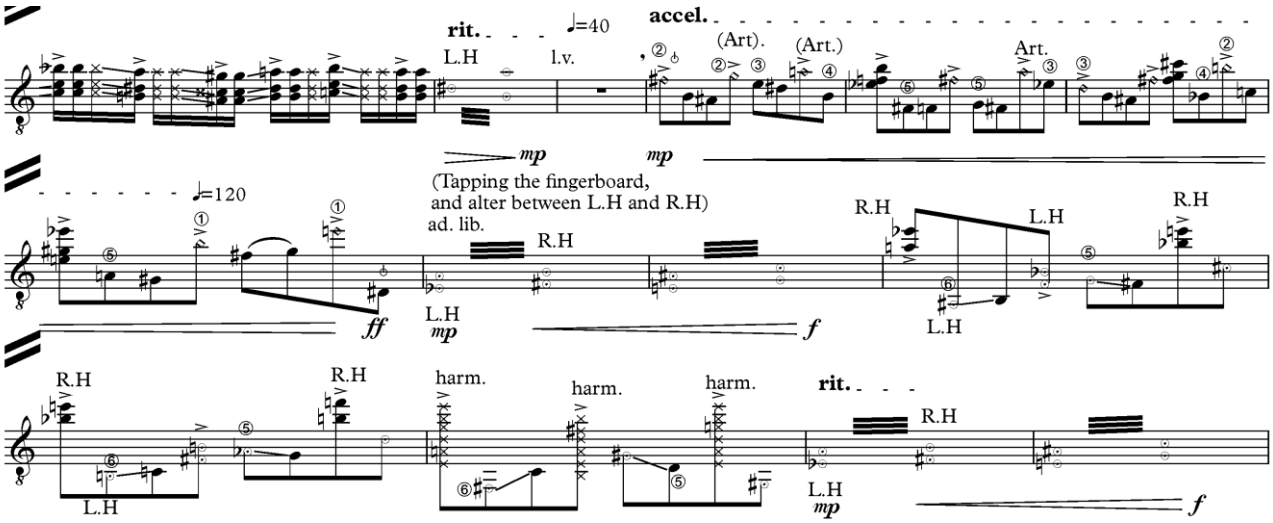

Figure 45 – Excerpt from *Dancing Rain* m.110-123

The virtuoso guitar performance builds up a foundation of texture from m.94 to m.131, until the flute rejoins the duet from m.132 (Figure 46). The alternation of slap tone (weakly defined pitch) and normal tone, in the flute, enhances its rhythmic character alongside the guitar.

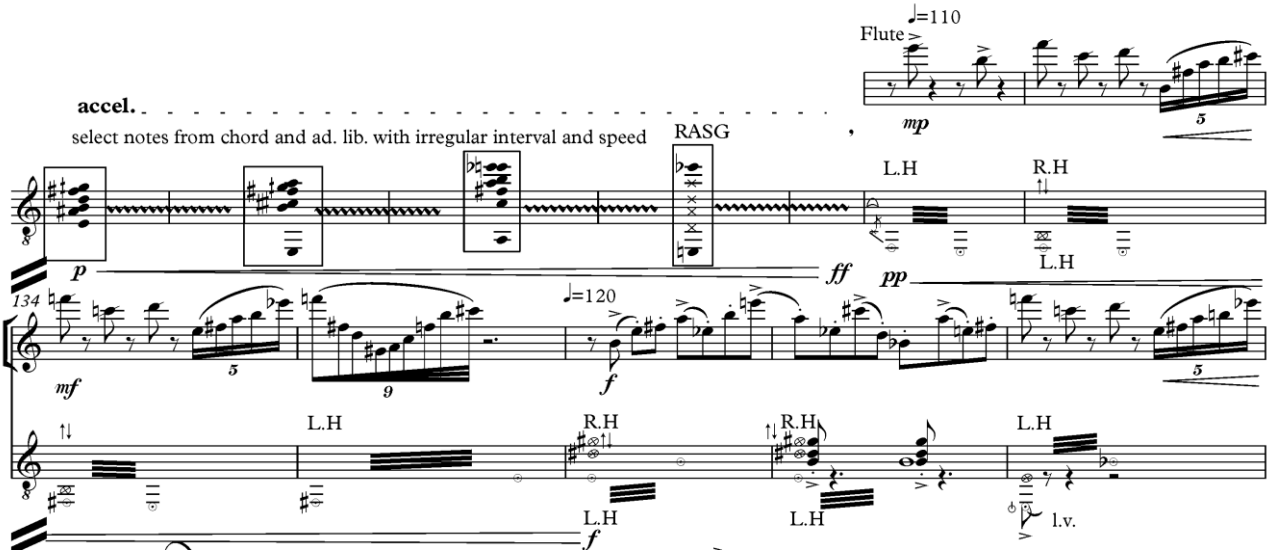

Figure 46 – Excerpt from *Dancing Rain* m.124-138

In the final stage of the episode, flute and guitar build up speed and intensity from m.168 until the fortissimo climax (Figure 47).

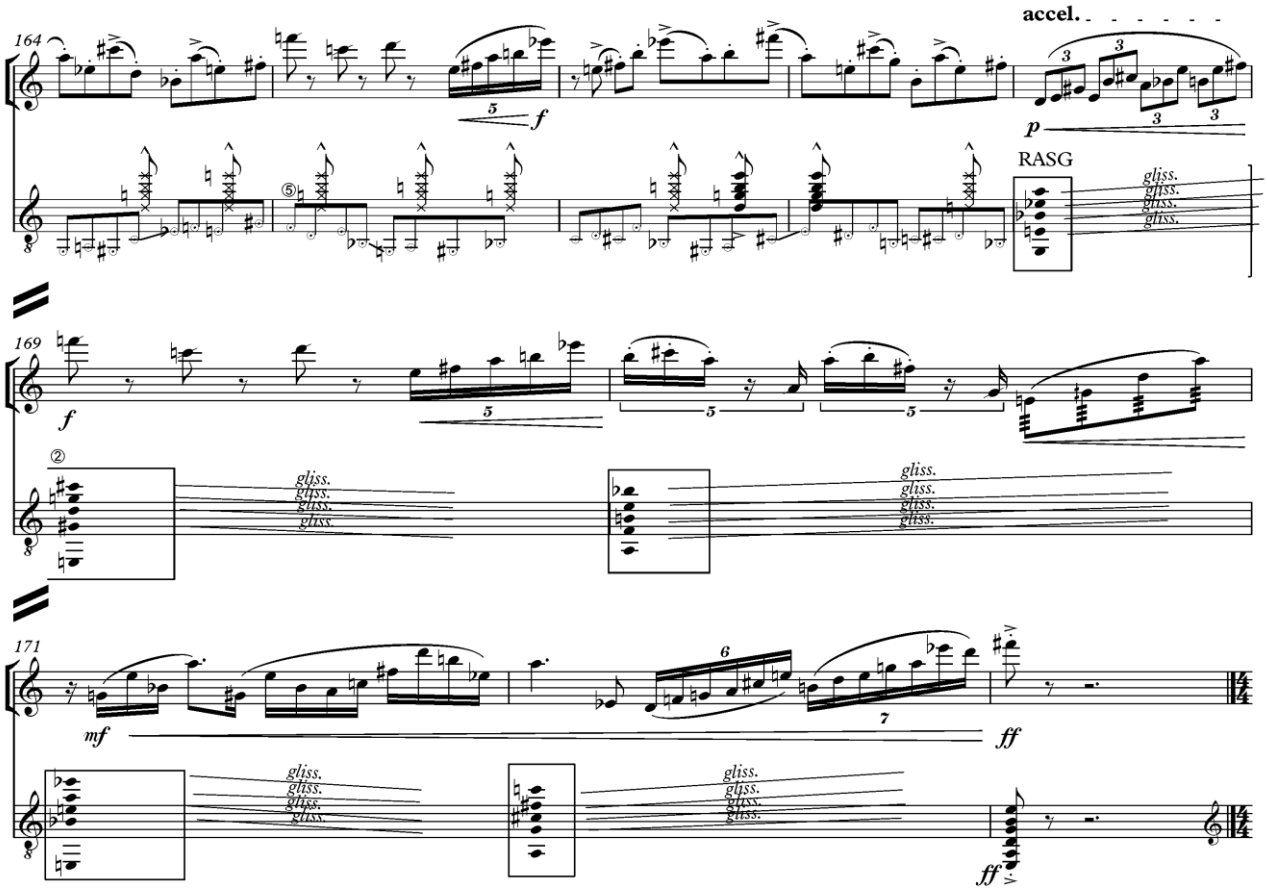

Figure 47 –Excerpt from *Dancing Rain* m.164-173

Monologue

Looking at the stars in the twilight sky.

Listening the sound of silence.

In this solo flute episode, the E spectrum is fully revealed through timbral exploration.

The use of multiphonics, aeolian sound, microtones, timbral trills, and simultaneous

voice, transforms the sound world of the flute to become more like that of shakuhachi, including its expressive character and rich sound shape. The formal conception of the episode is nonlinear. Each of the long-duration tones in multiphonics can be the anchor of a phrase. The multiphonic tones are all build on the foundation of the E spectrum, but with different colour at each occurrence. The multiphonic has no inherent directionality, and despite its internal shaping of intensity, has an aspect of stillness that can be the start or ending of the phrase. The intensity of the sound and local speed is transformed within each phrase.

Part 3 – Synthesis

Chapter 9 – Traditional Taiwanese Instrument Combined with Electronics in *Wing*

This piece was also commissioned. The creative process involved working closely with the performer Kuo, Min-Chin. The inspiration for it came directly from the sounds I created with the performer.

Wing returns to the idea of solo + electronics, and a deliberately similar choice of electronics format to *Zoom*, but now drawing on all my earlier investigations. It is also anchored on a Chinese instrument and the composition took place in Taiwan, as opposed to the quintessentially Western piano and composition in the UK. The piece was commissioned by Taiwanese Guzheng musician Kuo Ming-Chin, and I sought to explore the new sound and timbre of traditional Taiwanese Guzheng. The compositional idea of the piece is the spirit of exploring the unknown, and the desire to explore a new world.

Collaborative processes

Wing was inspired by sounds created during the interaction of composer and Guzheng performer. Materials for the whole composition were created during the interaction process as a pre-compositional stage. In order to create a piece not only for the instrument but also tailored to the performer, I first prepared many electronics cues in similar manner to *Zoom*. The cues were based on a single Guzheng sound sample, and developed into different timbral variations from simple to complex, from concrete to

abstract, from short to long, from single note to sound morphology. I used these cues in live interaction with the performer, as part of a duet improvisation. I suggested that the performer listen to the cues first; then he could follow the cue, adding a counterpart, or doing something knowingly unrelated to the cue in different technique, register, dynamic, and timbre. I recorded the sound from the performer, and we discussed some specific timbres of Guzheng extended techniques. The samples of the live recording became materials for the new electronics part. I used these new samples as core elements to extend, reorganize and develop into the electronic cues of *Wing*, and to aid the integration of the cues with the live performance part for Guzheng and its depiction in notation.

Pitch Materials

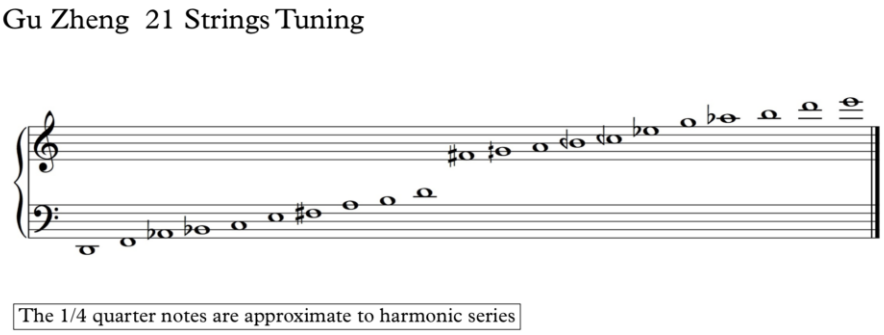

Figure 48 – Guzheng 21 strings tuning of *Wing*

I designed a new tuning scale that melded the Guzheng character and the harmonic series. The scale has a pentatonic character at its beginning and end, with added quarter tones in the middle register that relate to the D harmonic series (G quarter sharp ~ 11th

harmonic, etc). The scale itself does not belong to any existing mode, but is designed as a timbral whole.

Structure of the Piece

The piece is structured in distinct consecutive sections. The idea of the compositional structure is to focus on the extension of the Guzheng timbre, spectral variations, diffusion and integration into the physical space. The performance of the Guzheng rides on the wing of the live electronics, and varies gradually with the morphology of electronic sound: between silent and active, simple and complex, light and thick. The Guzheng performer calls upon and soars through the full range of emotion, speed and timbre.

I was asked by the Guzheng performer to create a "performance score" for him which would include section marks, timeline, duration of each section, and the timing of the electronic cues (Figure 49). During live performance, the Guzheng player uses a tablet computer to see the timing and electronic cues of the Max patch, synchronously with the screen controlled by the composer. In the performance score, the Guzheng part is indicated by alphabetized sections (corresponding to rehearsal letters in the full score), the duration of the Guzheng material to be performed in that section (shown between the rehearsal letters), and the timeline (above). The electronic part is indicated by cue number and its entry point on the timeline.

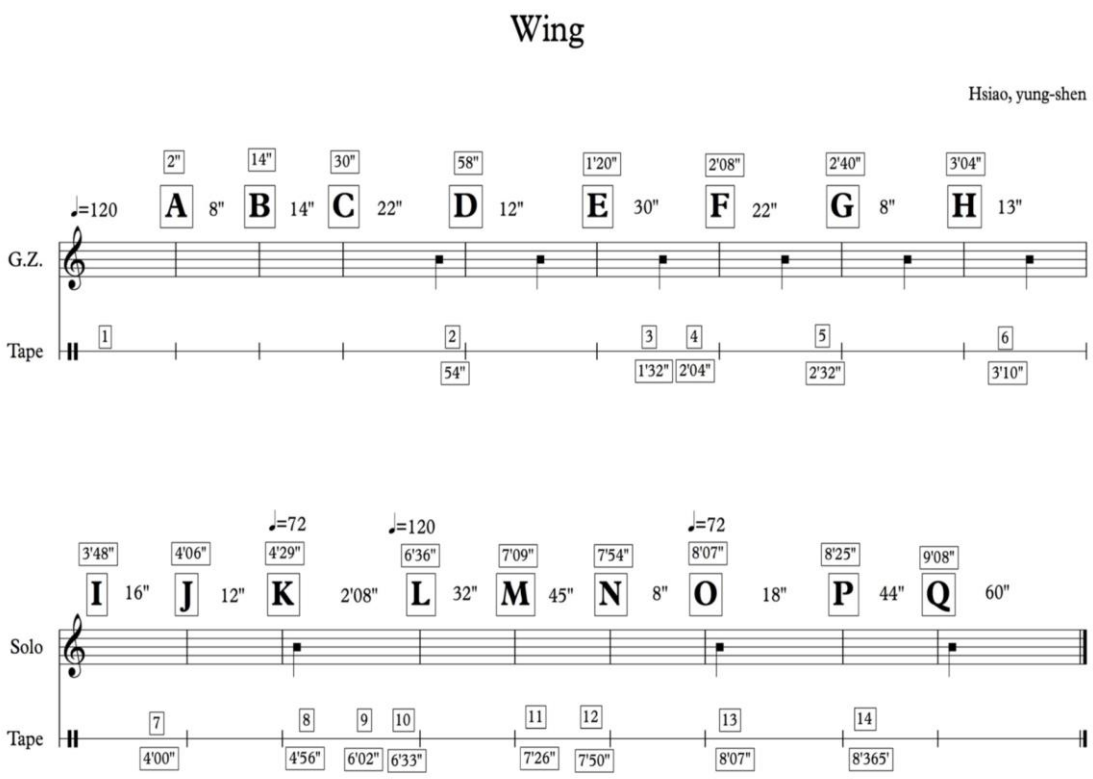

Figure 49 – Performing score and cues of *Wing*

Live performance and electronic materials

The electronic cues are fourteen fixed soundfiles which are composed in stereo format. Only the start time of each cue is shown in the score. The interpretation of the piece is made in response to the given time frame and the interaction of guzheng and electronics, instead of being fixed by bars and beats. The guzheng performer can control the speed of materials within that time frame. The electronic cues are controlled and triggered in real time, by an electronic performer following the score. This design gives space for the performers not to be restricted by fixed cues, but to interact as they would in

chamber music. The dynamic level of the electronics is also controlled live, according to the room acoustic and the guzheng performer's delivery.

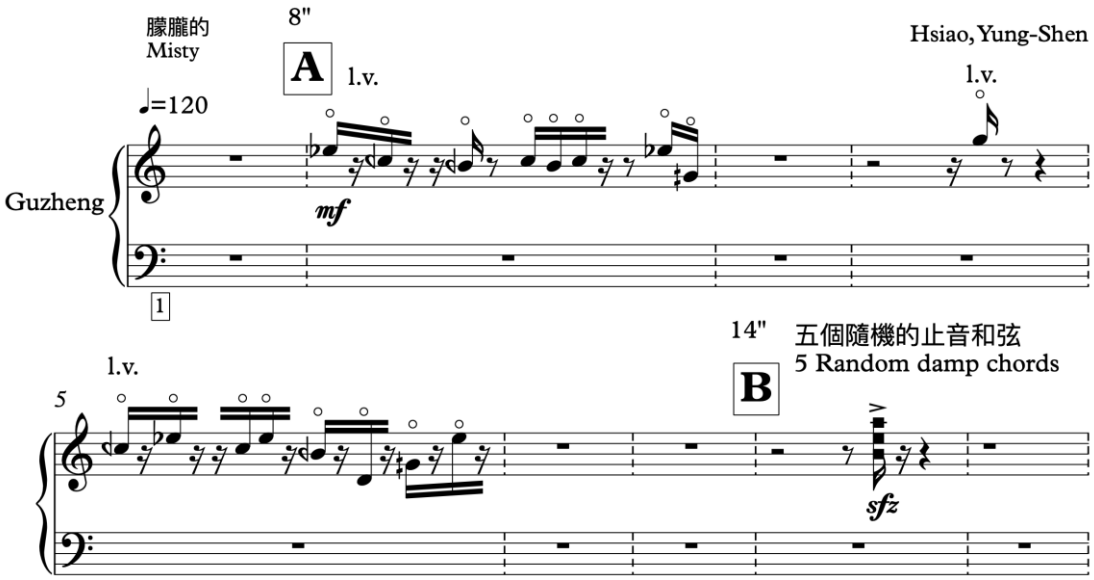

Figure 50 – Excerpt from *Wing* m.1-9

Extended Technique and Notation

In traditional Guzheng repertoire, the notation of extended techniques is limited, not systematized as for western instruments. Therefore, most of the new techniques developed by composers or performers often use customized symbols or texts to describe the technique and sound. Interacting with traditional musicians for this piece was very different from interacting with classically trained musicians as they approach music and sound differently in terms of the order of their process of understanding. In my experience, classically trained musicians are taught to first look at the notation and then to search the score for musical ideas such as written dynamics, expression, and

phrasing. But for this piece, the musician first tried to understand the general artistic conception, and then transcribed it (using symbols and text) so that he could read it at a later date. He also wanted to keep a certain amount of “space” to enable him to interpret the piece “in the moment”, which means he might interpret it differently each time. My impression is that the musical philosophies behind these two traditions are quite different and may sometimes come into conflict. In my experience, classically trained musicians are more rigorous about accurately translating notation into sound, while traditional musicians focus more on creating the desired mood through their performance.

As an example, in m.34-51 of *Wing* (Figure 51), the sound of the timbre is described in text: “Tremolo on random mute string, from one string expand to two string”, “Left hand palm suppress on strings, and varies the pressure to modulate the timbre, random notes on right hand, and expand register gradually.” The notation gives the performer important information in performing techniques, process, and the profile of the dynamics, but is not written out note by note.

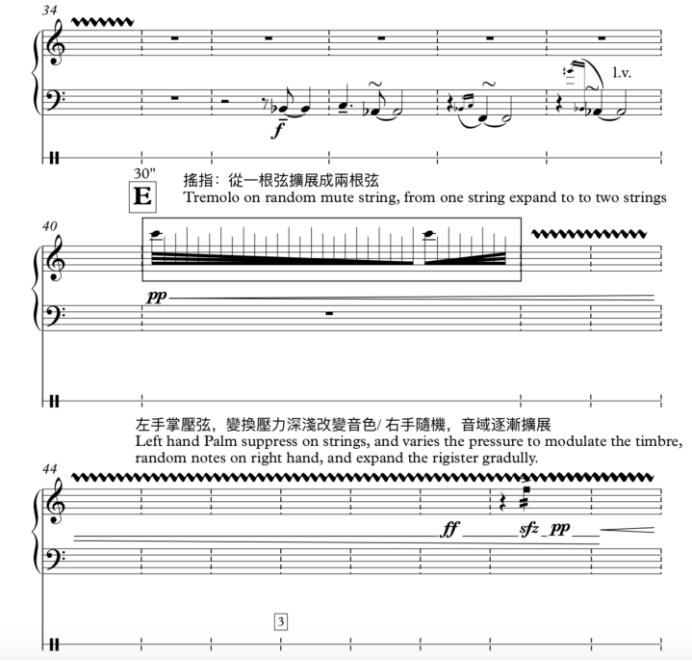

Figure 51 – Excerpt from *Wing* m.34-51

Chapter 10 – Taiwanese aboriginal element in KUBA

Kuba has the largest instrumentation within the PhD portfolio, and involves Taiwanese cultural materials. I had explored orchestral writing, drawing on my parallel professional interest in creating music for moving image, in two short works for animated film, ***Basmati*** and ***Maximall***. These used mainly conventional idiom, and hence are not included in the portfolio, but were a useful exercise in the creation of atmosphere and change, using the orchestral palette. They are discussed briefly in the Appendix.

This piece was inspired by my visit to the Tsou tribe. The material comes from a tune used in a Tsou festival. During the composition period, I listened to Chen, Qigang's orchestral work Reflet d'un Temps Disparu. I was drawn by the orchestral texture integrated with linear phrases and rhythmic driving elements, so I used these elements in my work.

Cultural background

The choice of topic for *Kuba* was inspired by my visit to the Tsou aboriginal tribe in January 2015. The name "Kuba" comes from a central element in the *Mayasvi* ceremony of the Tsou people, and my music presents my personal experience during the process of the ceremony. I was impressed by the unique cultural background: the form of ceremony, its blessing of the young, inherited rituals, powerful symbolism, and the rhythm of its music.

A television documentary about the *Mayasvi* ceremony is available on YouTube (in Chinese),[37] and a number of websites provide descriptions. The "Mata Taiwan" site, introducing a detailed account, notes that "the 'Mayasvi' or Ceremony of War and Triumph is the greatest event in the calendar of Taiwan's Tsou people. [It is now] only carried out in either Tefuye (Tfuya) or Dabang (Tapangu) village in Alishan."[38] This site also points to the present-day "dilemma of preservation and commercialisation": the ceremony is now a cultural attraction for visitors, but retains its inherent importance for the Tsou. Another site, "Taiwan Religious Scenes Top 100", is clearly targeted at the external market, but gives a useful summary of the festival's content and significance:

> The Mayasvi Festival is one of three major festivals of the Tsou indigenous tribe. The festival reflects historical ties between the various Tsou clans. Most of its events revolve around the kuba, the tribe's meeting house, which serves as the main gathering place and spiritual center for the men of the tribe. Mayasvi reinforces tribal solidarity, illustrates the differing roles the men and women of the tribe play in maintaining tribal ethics, norms of life, dances, and religion,

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[37] Mayasvi Ceremony of Tsou: https://www.youtube.com/watch?v=WNcj9MtWyQY, "2012 年特富野社 Mayasvi 全紀錄", Taiwan Indigenous TV, 5,March,2012. accessed 4/7/2019.

[38] Tsou Mayasvi: https://www.matataiwan.com/2014/03/11/english-mayasvi-the-ceremony-of-war-triumph/, accessed 4/7/2019.

and preserves the rituals through which the wisdom of the gods is venerated. The polyphonic choruses sung during the festival keep alive a longstanding heritage of tribal music, literature, and history. In recent decades, external influences and pressures have resulted in the Tsou Tribe becoming Sinicized and adopting Chinese language, lifestyle, and customs. In the face of the gradual disappearance of the Tsou way of life, tribe members have begun to use the Mayasvi Festival as a vehicle to commemorate and preserve their traditional culture.[39]

[39] Tsou Tribe Mayasvi Festival: https://www.taiwangods.com/html/landscape_en/1_0011.aspx?i=71, copyright by Ministry of Interior Affairs, Republic of China (Taiwan), accessed, 26/04/2019.

Figure 52 – Mayasvi festival of "Tsou"[40]

Structure and Form

The structure of my piece has a close relationship to the process of the ceremony. The ceremony itself has very complex structural detail at each stage; however the structure of the music extracts the spirit of the process instead of reproducing it as a whole. I selected the following stages of the ceremony, described here in wording from the "Taiwan Religious Scenes" website:

[40] Ibid.

The Mayasvi Festival is divided into four stages: preparations (smouyu'ho), the main ceremony (mayasvi), the song and dance celebration (pasu-mayasvi), and the final ceremony (mepungu). Preparations for the festival are complex: the men set up the sacred objects in the KUBA, rethatch the roof, and clear a path to the hunting grounds to signify a successful hunt. The women prepare the sacrificial offerings for the festival and make wine and glutinous rice cakes.

[..]

Ceremony to welcome the gods: This ceremony includes activities such as carrying torches to bring the flame of KUBA into the festival grounds, making offerings of livestock, and cutting the branches from sacred Yono trees to create a ladderway for the God of War to descend from his heavenly seat. Only three branches are allowed to remain, one pointing in the direction of the KUBA, a second pointing the way to the sacrificial shrine of the Wang Clan, and a third leading to the sacrificial shrine of the Wu Clan, symbolizing the continuity of tribal life. Finally, sacrificial offerings are made to the gods and welcoming songs are sung to summon the God of War.

Tribal Unity Ceremony: Each Tsou clan brings sacrificial offerings such as rice wine and glutinous rice cakes to the village. A toast is made and food is offered to entreat the God of War to provide the warriors with the strength to fight.

Merit-Citing Ceremony: Warriors assume a fighting stance and cite heroic exploits of their ancestors to enhance morale.

Sending-off Ceremony: Warriors hold hands and encircle the fire to sing farewell songs to the gods to send the God of War back to heaven.[41]

The music is a transformation of the inner reflections and personal imagination of one man (myself) experiencing the process of the ceremony. Nonetheless, I give many concrete "instruction images" in each section of the score: these help me in mapping the related stages of the ceremony and in connecting them to my imaginitive world as a whole.

The form of the music consists of 17 sections from A to Q, shown in Figure 53:

Section	Measure	Pitch Center	Description	Matrials
A	m.1–m.38	C	Waiting for dawn	Motive, Texture
B	m.39-m.53	A	The Ancestor gives instructions	Melody, Polyphony
C	m.54-m72	C	Announcement to welcome God	Rhythm, Meter variation
D	m.73-m.86	E	Ignite the holy fire	Gesture, Texture
E	m.87-m.94	G	Building ladder	Rhythmic texture

[41] Ibid.

F	m.95- m.108		Transition	Cluster, texture
G	m.109- m.124	A	Welcome to God	Rhythmic texture, Motive variation Contrapuntal
H	m.125- m.137	A	Ladder completion	Gesture, Rhythmic texture, Melody
I	m.138- m.154	A	A ladder of choices	Meter variation, Melody
J	m.155- m.159	B	God's door is open	Melody, Gesture, Texture
K	m.160- m.187	Bb	God's Watch	Rhythmic transition
L	m.187- m.194	E	Transition	Rhythmic texture
M	m.195- m.206	Bb	Transition	Texture of gesture
N	m.207- m.222	E	Ceremony of Adults	Rhythmic texture
O	m.223- m.252	A	Farewell to God	Melody. Ostinato
P	m.253- m.263	C	Kuba	Texture
Q	m.264- m.277	C	Sacred Sound	Theme

Figure 53 – Structure and form of *KUBA*

Musical material and concept

The primary musical concern of the piece is to explore the idea of a “sound object” inside the bigger scenario, and to create musical development by transforming the object in relation to the narrative. The most important musical symbol in the Tsou Mayasvi Festival is the tune “Eyana”, which is sung together during the ceremony. As a transcription of the score shows (Figure 54), the melody contains only the four pitches C, E, G, A. In the western view of harmony, it can be seen as a C major triad with an added sixth. The form of the two voices has a relationship of “call and response”. The structure of the whole tune is repeated through slightly variation. This tune becomes my “sound object”. My challenge is then how to use this object as a core element and develop it into a large-scale orchestra piece, and also express the internal drama of the ceremony with intensity and musical continuity.

At the largest scale of view, the end of the piece is resolutely in C major and presents the main theme of the ceremony. Although this appears fully only in the final stages, its fragments already exist from the very beginning of the work, and throughout the piece in several sections. The structure of the work is based on a small motive and its variations alongside the different stages of the ceremony.

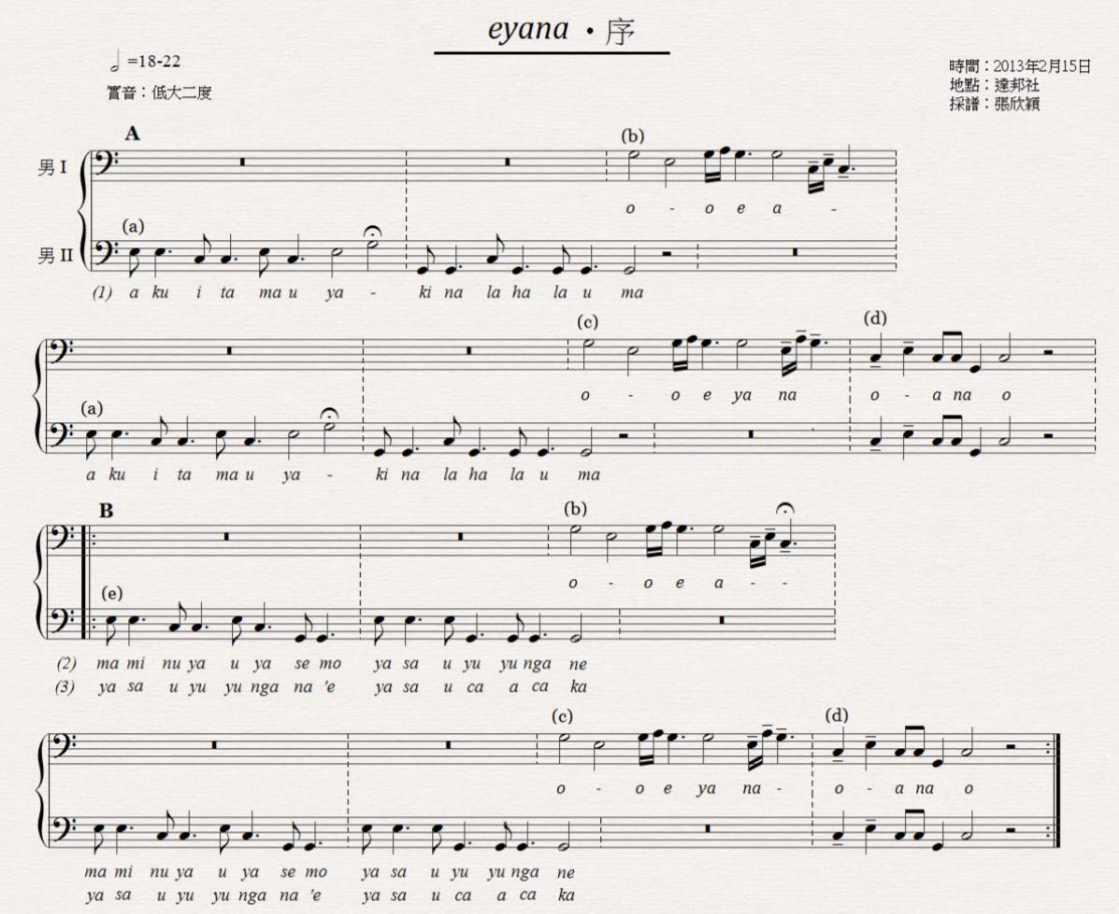

Figure 54 – Original tune of the ceremony: *Eyana*[42]

Thematic elements

There are three main elements in the ceremony: the theme of Eyana; the God of War; and the man who participates in the ceremony. For the first of these, the complete theme of Eyana only appears in the final stage of the music (section Q, m.264-), but the theme

[42] Chang, Hsin-Ying. A Study of Mayasvi Music in Cou(Tsou) Culture: Based on Tapangu Tribe, p.99, National Taiwan Normal University, department, master thesis, 2014. https://hdl.handle.net/11296/g7x9qr

is deconstructed in several fragments in m.7-8, m.183-184, m.212-214, m.245-249. The Eyana theme represents the consonance and completion of the ceremony. This is my basic thinking in using the sound object: the original sound revealed gradually through the process of time. The second element is the theme of the God of War, which represents motion and intensity. In the music, it is characterized as a triplet motive, first heard in m.16. The triplet idea is derived from the frequent dotted quarter notes in the Eyana theme. The motivic element of the triplet is fully extended and develop throughout the piece in different musical morphologies. The third element is melody, which represents the inner voice of the man. The melody appears in section B (m.39-52), and transforms its character in m.82-86, m.133-137, m.155-159, and m.253-263.

Rhythm and Speed

In addition to rhythmic gesture at the local scale, there are two main designs of rhythm in the middleground. One is through changing the speed gradually, the other through variation of metre. Sculpted changes in the speed help create larger arcs, and also control the curve of intensity. In section A, the metric pulse changes from ♩=76 to 120 to 52, with this speed-profile following the complexity of the musical content. Similar examples can be found in section D (m.73-86), H (m.133-m.138), J (m.155-159), and O (m.248-252). The second approach, changing metre, helps create rhythmic phrasing and shifts the perception of how time flows. Section C (m.54-72) use several irregular metres to create rhythmic effect, and also polyrhythm by different grouping of notes

and accent (m.60-61). A similar approach can be found in I (m.138-154). These two approaches can also be combined to create a more intensive effect, such as in section F (m.90-101).

Texture and spectrum

Ensemble music, in historical practice, includes idiomatic textures such as monophony, polyphony, homophony and heterophony, all of which are usually depicted in music notation. However, in electroacoustic music, any sound units can be manipulated, transformed, mixed and layered. The new texture consists of spectral information beyond note and pitch, and the relationship of materials is expanded from "note to note" to "sound to sound". The result is an expanded "spectral texture", which might be considered to include the historical types as special cases, along with their constitutive units of pitch, rhythm, and harmony. The texture is formed by fusion of several sound units which may lose their original identity, becoming integrated into a synthetic whole. This kind of discourse from electroacoustic music and spectral music inspired my thinking about orchestral texture in *Kuba*.

The beginning of *Kuba* (section A) consists of several sound units: timbral gestures in clarinet, percussion, and harp. The triplet motive in celeste and harp, long sustained drone in strings, fragments of theme in the brasses – each of these sound units has less identity on its own, but they grow gradually into a spectral texture, to find a larger shape. This texture contains the transformed original sound units, and also expands a timbral

dimension in which the spectral texture can be perceived as a whole. This kind of spectral texture appears variously in section D (m.73-86), F (m.95-108), and M (m.195-206).

Conclusion

Why does Taiwanese music sound the way it does, and how can we explain it? What are the timbral characteristics of this sound? What insights can we gain by translating this sound into the different medium of Western instruments and ensembles?

One could ask: “If you want to understand Taiwanese music, why don't you just write Taiwanese music?” Yet people understand who they are and where they have come from, more intensely, when they are somewhere else. Musical culture forms part of self-identity, and music can help in that self-discovery. We can understand the sonic quality of Taiwanese music more intensely by setting it in contrast to and re-translation through Western musical instrumentation and methods. We can see Taiwanese music in a new perspective.

By undertaking my doctoral research in Europe, and composing music for Western instruments and ensembles, I have chosen a particular context that lets me reflect back on the object of study. It sets the conditions for an experimental process. I began my thinking as an “insider”. It needed the perspective of an “outsider” in order:

- to understand a different sonic terrain
- to understand the mapping of one sonic terrain onto another
- to hear more accurately the differences through comparison and juxtaposition

From this perspective I can say of Taiwanese music, not just that "it is like this" – but also that "it is *not* like that".

Through my own music, I hope to help other Taiwanese musicians reach new understanding of themselves through the dialogue with unfamiliar resources.

The following summary will explain my thoughts and approach to related issues I discovered during my PhD.

Musical Language

My works in the portfolio have influences both from electroacoustic music and spectral music works. In my electroacoustic works, I am always inspired by the perception of sound: the shape of sound and its motion; the propelling gestures and internal texture of sound; how sounds can be transformed from one to another. In my mixed works and acoustic works, I am thinking both about the sound shape and the spectral space. For me, electroacoustic music and instrumental music are not divided by their different interfaces.

In classical music, the musical materials of melody, rhythm, and harmony can be thought of collectively as a part of a sound object. One sound contains pitch, rhythm, and harmony as a whole dynamic timbre. If we zoom into the sound's interior, we can use the structure inside the sound as musical material. In my piano and prepared guzheng-sound work: *Zoom*, I use this concept as the structure for the whole piece. The

guzheng sound sample is the sound object, this sound is analyzed, and I obtain musical material from it, and expand the object into the whole process of the piece.

In my orchestral work *KUBA*, I use the concept of a sound object as the core element, which comes from the tune of "Tsou" (Eyana). The melody has a tonal triadic character, but also can be recognised as a sound texture if one takes a spectral attitude. Therefore, the variation of the theme, in retrospect, has much more potential than only one triad. Through processes of dilation it could become a complex spectral texture, inclusive of tonal and atonal materials.

In my electroacoustic and instrumental works, my thinking has been directed towards a systematic approach to organize the pitch material in relation to the notion of sound. I have been trying to find my own way to make pitch materials become part of timbre, going beyond mathematical calculation. I have tried to develop how the sonic character of the pentatonic can be used spectrally in my pieces *Circle*, *Zoom*, and *Winter Fantasy*. There are different approaches I explored in these works. The pentatonic mode is not used only as a scale and to form the melody, I hope it is apparent in a sonic way both vertical and horizontal, and can be perceived not just by notes but in spirit. In *Circle*, I used a central node as the middle of the space, the spectrum expanded radiantly from the center and morphing through the pentatonic sounds. In *Zoom*, I analyzed the guzheng sound and used the harmonic pitches as a pair of pentatonic scales. The scales were transformed in spectral thinking and created a circular pattern themselves. The

circular process is the form of the piece. In *Winter Fantasy*, I used spectral distortion techniques to produce pitch material. I used the materials both with micro-tones and pentatonic thinking. The materials are masked in the beginning, fused into a sound object, and reveal the pentatonic melody material at the end. The piece is based on the A spectrum, transforming its colour by spectral distortion and finally reaching the D spectrum at the end. In *Mystery of Nature*, the harmonic series of the E spectrum is used throughout four movements. The spectral pitch space is enhanced by the involvement of extended techniques, such as multiphonics, vocalisation in the flute, and bi-tone and rasgueado on the guitar. The tuning of the Guzheng in *Wing* is designed by combining three pentatonic modes and the harmonic series, and integrated with live electronics derived from the same pitch materials which expand a higher dimension in the timbral space.

I start to experiment with concepts of harmony from *Circle* onwards. I designed a bi-pentatonic chord, and used this chord as the harmony of the piece. The harmony voicing changes with the density of the timbral texture. In *Zoom*, I used a bi-pentatonic chord and its transformed versions to create a spectral circle. The harmony gradually moves from one pitch collection to another, finally moving back to the original collection. The harmony also shifts emphasis between pitch and timbre.

In my work *Zoom*, I tried to re-synthesie the Chinese guzheng sound into piano writing, and create a hybrid instrument as an extended piano. I wanted to mix the piano and

prepared electronic sound as a whole instrument rather than the relationship of two instruments. In *Winter Fantasy*, I sought to re-synthesize the Chinese Nanguan ensemble sound on the string quartet. I used some string extended techniques and microtones to emulate the sound world of Nangaun. In *Wing*, the sound of the electronics is a transformation from the same instrument and the performer, with the synthesis of Guzheng and electronics thereby forming a new "Hyper-Guzheng". The natural and virtual sound are re-synthesized together in both pitch space and physical space.

Cultural Synthesis

Many composers use cultural elements as their compositional material. In my work, I tried to employ both cultural materials and aesthetics into my works. The discussion of musical language, above, points to many of these strands. In my use of instrument samples, circular structures, creation of hybrid instruments, and structural-scale dilation of small musical objects, I hope both the sound quality and music structure reflect my perception of the eastern culture. In my works drawing on traditional Taiwanese music (Nanguan, Beiguan) and Taiwanese aboriginal music (Tsou melodies), it is both the sounds and the cultural practices that become transformed into my work. In some case the transformation is thorough: in *Winter Fantasy*, sonic aspects of Nanguan are resynthesized in the contemporary string quartet, with melody only gradually revealed.

At the largest scale, an extended Taiwanese aboriginal ceremony is developed into the structural shape of an orchestra piece in *KUBA*.

Future plans after the PhD

I will continue developing my own compositional approach through influences of Taiwanese cultural elements by musical language of electroacoustic and spectral music, and extend my portfolio into larger instrumental forces.

My plans for future works include:

1. Write for conducted chamber ensemble with electronics

Construction of a larger scale mixed electroacoustic composition through collaboration with ensembles. This composition will explore how gestural and ensemble space can be combined with surround sound to create "extended orchestration" through the manipulation and grouping of different textures and timbres.

2. Write for choir

Using voices to build a spectral space without electronics.

3. Orchestral work

Synthesizing cultural materials into western orchestral instrumentation, integrated with a spectral approach.

4. Seek opportunities for experimental film scores

Collaboration with a filmmaker in Taiwan, who pursues a professional career in creative filmmaking. Explore “sound-based” music composition and its interaction with other sound layers and the moving image. The unity of the film could be centred on a musical idea and its sonic character.

Appendix – Preparatory Studies

Basmati

I found an opportunity to write both for orchestra and for animated abstract film, through a competition which is held in order to memorialize an act of terrorism at the Stazione di Bologna, 1980. According to the competition website:

> The Twentieth Edition of the "2 Agosto" International Composing Competition is announced and it is promoted by the "Associazione Familiari Vittime della Strage alla Stazione di Bologna del 2 Agosto 1980", the "Comitato di Solidarietà alle Vittime delle Stragi", in collaboration with the Fondazione Cineteca di Bologna, and the Fondazione Teatro Comunale di Bologna. The 2014 edition of the "2 Agosto" International Composing Competition is realised in collaboration with the Scuola Nazionale di Cinema – Centro Sperimentale di Cinematografia di Roma, the Fondazione Musica per Roma, and the Conservatorio Nazionale di Santa Cecilia. The Competition is developed under the High Patronage of the President of the Italian Republic.[43]

My goal in this work was to develop and demonstrate my ability in orchestration, as grounding for a larger-scale work in the future. I wanted also to explore the relationship between musical language and visual language.

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[43] http://www.concorso2agosto.it, accessed 20/05/2014.

The competition rules note that "competitors are requested to bear in mind that one of the main aims of the Competition is the open air performance of the winning scores. Therefore the Jury will not take into consideration those scores that are unsuitable for open air performance, even if through a suitable amplification."[44] I decided to use an orchestral palette to reflect the dynamics and the movement of the animation, but to keep the musical language broadly conventional without too bold an experiment in extended techniques. I composed on the piano first to find the energies and the movement of the animated film, then orchestrated it according to the colour and intensity of the music.

I did not introduce my spectral thinking to this work in its pitch aspects, but used a more traditional approach to present the material evolution through time and to synchronize with the visual movement. The work can be seen as preparation for more spectrally-intensive music, at larger scale, later in my PhD.

[44] Ibid.

Maximall

I found another opportunity to write for orchestra and animated film through a competition held by Forum Filmmusik. According to the organizers:

> The third International Film Music Competition takes place during the 10th Zurich Film Festival (25 September – 5 October 2014). The competition and the film music concert are organised by Zurich Film Festival, Tonhalle Orchestra, and Forum Filmmusik. Five entries will be nominated and world-premiered in the Tonhalle Zurich on 1 October 2014 by the Tonhalle Orchestra under the baton of Frank Strobel.[45]

My goal in this work was to use orchestral language to interact with the drama of the film, and also to develop my ability in making a professional orchestra score and a digital orchestral mockup.

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[45] https://filmmusiccompetition.ch/en/, accessed 6/20//2014.

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